


Spring 2011

The Effects of Expressive Writing on Anxiety, Mathematics Anxiety, Stress, Cognitive Processes and Psychological Processes on the Virginia Standards of Learning (SOL) on a Sample of Urban High School Students Failing Mathematics

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EFFECTS OF EXPRESSIVE WRITING

Working Title: The Effects of Expressive Writing on Anxiety, Mathematics Anxiety, Stress,
Cognitive Processes and Psychological Processes on the Virginia Standards of Learning (SOL)
on a Sample of Urban High School Students Failing Mathematics

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A Dissertation Presented to the Faculty of the Darden College of Education
in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

COUNSELING

OLD DOMINION UNIVERSITY

May 2011

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ABSTRACT

The Effects of Expressive Writing on Anxiety, Mathematics Anxiety, Stress, Cognitive Processes and Psychological Processes on the Virginia Standards of Learning (SOL) on a Sample of Urban High School Students Failing Mathematics

Claudia L. Hines
Old Dominion University, 2011
Director: Dr. Nina W. Brown

High school students who fail one or more mathematics' classes tend to be more likely to fail the Virginia Standard of Learning (SOL) tests and thus delaying their graduation. The purpose of this study was to examine the effects of expressive writing on general anxiety, math anxiety, stress, cognitive processes and psychological processes on the Virginia Standards of Learning (SOL) on a sample of urban high school students failing mathematics. The participants (n=93) male and female students in grades 9-12, ranged in ages from 14 to 19 years of age, from various socio-economic backgrounds. The intact classes were used to reduce disruption of the instructional process and to encourage teacher cooperation. The experimental group (n=54) wrote on a value latent topic and the control group (n=39) wrote on a neutral topic. When compared to the control group, statistically significant results revealed the experimental group reported lesser levels of anxiety after the writing intervention. Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. During the SOL geometry mathematics test, the experimental group had a 52% pass rate and the control group had a 49% pass rate.

Key words: adolescents; expressive writing; stress; test anxiety; cognitive processes; Virginia Standards of Learning Test

I dedicate this dissertation to my mother, Delores E. Hines for supporting and believing in me. To my special friend, Mr. John E. Smith for spending hours assisting me in calling out data to input into the system and the endless weekends and nights he has spent helping me, believing in me and supporting me throughout this process. To Paul Rose, a loyal and dedicated friend for over twenty years for his continued support, patience and assistance. To my cousin, Brandon Timmons, who thinks I can conquer anything. To my sisters, brother, nieces, nephews, great nephews and cousins, I hope that this accomplishment will show them that when you put GOD first, anything is possible. To my Aunt, Ms. Bessie Washington, the pillar of the family and to my late Aunt, Ms. Geneva Rogers for words of wisdom. To my late father, Mr. Herslee Hines and to my dear late Grandmother, Claudia Snead, who did not have the opportunity to share my accomplishments.

ACKNOWLEDGEMENTS

I would like to first give honor to GOD for making all of this possible for me. Without him none of this could have happened. I sincerely thank Dr. Nina Brown for her belief in me and never giving up on me. She has been very instrumental in keeping me focused and supporting me through her mentoring and words of encouragement. To Dr. Steve Myran the many hours spent helping me to interpret data. The principal, Dr. Rory Stapleton, has supported and made it possible for me to conduct my research. Ms. Sherri Sanchez, and Ms. Sharon Baker who have both proven to be teacher advocates for children throughout the process. To my friends and colleagues, Ms. Syreeta Shaw-Stateman and Ms. Caron Cole for their continued belief in my academic and professional endeavors. To Dr. Bertha Davis and to the late Dr. Ollie Bowman for seeing this vision for me before I saw this accomplishment as a reality. To Dr. Richard Mason for his time, patience and support throughout this process.

I would like to thank Dr. Remley for his belief in me and for sharing his wisdom with me during my supervision process and for all the invitations he has extended to all doctoral students at his home. To all of my professors for their support comments and imparting their experiences and knowledge. To the previous candidates of this research, Dr. Sophia Taylor, Dr. Sharon Wisinger and Dr. Cynthia Jenkins for their support and feedback.

A special thank you is extended to Dr. Ashby Kilgore, Mr. Michael Evans, Dr. Darwin Mills, Ms. Letha Brooks, Ms. Varinda Robinson and Dr. Felicia Dyke for their support in assisting me with needed data as well as making sure I had everything I needed to start and finish this process. Ms. Brenda Poole has been a jewel in assisting me and

supporting me throughout the process. Ms. Karen Bazemore and Ms. Lisa Jones for sharing their expertise in technology. To the school counselors who have been an integral part calling in students to remind them to turn in their permission forms. To the mathematics teachers, Ms. Sanchez, Ms. Spencer and Ms. Baker for their support and assistance. An additional thank you is extended to Ms. LaVerne Hill, Ms. Gladys Jordan, Ms. Gloria Thomas and Ms. Lavern Flythe, four ladies who have always served as positive role models and have supported me in my professional and social growth.

My committee members, Dr. Steve Myran and Dr. Alan Schwitzer have been supportive and have assisted in making this quality work.

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CHAPTER I

INTRODUCTION

Mathematical understanding and high school assessments provide adolescents with skills and experiences that pave the way to both college and careers (Brown & Conley, 2007). High stakes circumstances or stressful environments may negatively undermine math performance when monetary and social consequences are linked with poor performance (Beilock, 2008). Virginia supports teaching and learning through statewide system of support and accountability for the commonwealth's public schools and school divisions.

The commonwealth sets rigorous academic standards, known as the Standard of Learning (SOL), which measures achievement through annual SOL tests and alternative and alternate assessments. The system provides schools, school divisions and the Virginia Department of Education with critical data to inform the development and implementation of effective instructional strategies and best practices. Standard of Learning assessments measure student achievement in English, mathematics, science and history/social science. Students are assessed in English and mathematics in grades 3-8 and at the conclusion of certain high school-level courses. SOL tests in science and history are administered in grades 3, 5 and 8 and at the end of high school-level courses in these subjects.

As public schools prepare students for the 21st century, the goal of the division of this urban high school is to successfully graduate students who are college, career, and citizenship ready. Though challenging, students have an opportunity to achieve their goals by meeting the graduation requirements through a selection of various diploma

types. Students have to pass a minimum of three mathematics' credits in order to obtain a standard diploma with a minimum of four required for the advanced diploma. Students will need to pass a minimum of one mathematics SOL in order to obtain a standard diploma and two mathematics' Virginia Standard of Learning credits to secure an advanced studies diploma. Courses completed to satisfy graduation requirements for students entering ninth grade in 2010 should be at or above the level of algebra and shall include at least three different course section offerings from algebra , geometry, algebra II or other mathematics courses.

The ethnicity breakdown of mathematics' performance on the Standard of Learning Mathematics Test at this urban high school division scores indicate the following pass rate based on 2009-2010 data. American Indian or Alaskan Native – 60%; Asian -77%, Black (not of Hispanic Origin) 57%, Hispanic – 67%, White (not of Hispanic Origin) – 74%, Unspecified – 60% with an overall performance rate of 63%. Thirty-seven percent of all students fail the mathematics Standard of Learning Test. The State has mandated a 100% pass rate by 2014.

Over the last several decades, researchers have underscored the adverse effect of test anxiety on student performance, apart from the students' previous academic achievement (McDonald, 2001). Hembree's (1988) meta-analysis of 562 studies examining the relationship between test anxiety and academic performance suggested that test anxiety is a significant factor that may inhibit academic performance. The proposed intervention is expressive writing, where participants write about a value- laden or neutral topic for 15 minutes over a period of three days. This intervention will be used to determine if expressive writing can be used to reduce anxiety and symptoms associated

with stress and increase students' overall math performance and performance on the practice SOL mathematics test.

IMPORTANCE OF THE STUDY

It has become increasingly urgent to find ways to reduce the failure rate on the mathematics Standard of Learning Test, prior to 2014 when the No Child Left Behind Act expects a 100% pass rate. Many cognitive interventions have been implemented, such as tutoring, study sessions, and Saturday school. Little attention has been given to addressing the psychological aspects, such as anxiety and stress. This study will examine these psychological constructs as related to performance on practice SOL mathematics tests, and investigate the effects of a short term writing intervention on these constructs and on performance.

There is a large body of research on the expressive writing paradigm as an intervention with clinical populations. Previous studies on Expressive writing have demonstrated its positive effects on health benefits with limited research on adolescents. This study will add to the research of knowledge as well as provide information that can be potentially helpful in understanding the relationship of these variables to the SOL mathematics' performance for this sample of urban high school students.

Background

Description of Division

This public school is a large urban school division in southeastern Virginia with approximately 30,500 students enrolled in its five high schools, eight middle schools, twenty-six elementary schools, five early childhood centers, and four alternative schools. The demographic breakdown indicate the following: 51.0% males and 49.0 % females,

55.7% African American, 29.0% Caucasian, 9.9% Hispanic, 0.1% Asian/Pacific Islander, 1.9% Multi-Race, and 0.5% Native American. Other demographic information includes 46.5% of students who qualify for free and reduced meals, 12.5% of students identified as special needs, 8.2% of students identified as talented and gifted, and 1.79% of students in need of English as a second language (City Public Schools, 2010).

Urban High School Mathematics Spring 2010 Performance: Grade and Gender

Table 1 presents this urban high schools' mathematics performance for males and females in spring 2010 in algebra and geometry by grade level. Geometry pass/fail percentages for female include 21.9% passing and 78.1% failing. Males passed at 31.3% with a failure rate of 68.9%. Ranges for grade levels nine through eleven indicate a pass rate of 75% to 23% for females and 79% to 34% for males. Geometry SOL scores indicate a decline in grade levels for both female and male students. A review of the performance during the spring 2010 Virginia Standards of Learning Mathematics Tests shows that the school has an overall failure rate of 41.1% with an overall passing rate of 58.9% in mathematics.

Table 1

Urban High School Math SOL Performance: Spring 2010

Test	Grade	Gender	# of Tests	# Passed	# Failed	% Pass Rate	% Fail Rate
Total			1,031	607	424	58.9%	41.1%
Algebra I	09	Female	70	65	5	92.9%	7.1%
Algebra I	09	Male	78	66	12	84.6%	15.4%
Algebra I	10	Female	45	29	16	64.4%	35.6%
Algebra I	10	Male	71	28	43	39.4%	60.6%
Algebra I	11	Female	13	6	7	46.2%	53.8%
Algebra I	11	Male	19	7	12	36.8%	63.2%
Algebra I	12	Female	25	16	9	64.0%	36.0%
Algebra I	12	Male	7	4	3	57.1%	42.9%
Algebra II (2001 Revised)	09	Female	41	39	2	95.1%	4.9%
Algebra II (2001 Revised)	09	Male	30	29	1	96.7%	3.3%
Algebra II (2001 Revised)	10	Female	67	46	21	68.7%	31.3%
Algebra II (2001 Revised)	10	Male	31	22	9	71.0%	29.0%
Algebra II (2001 Revised)	11	Female	38	16	22	42.1%	57.9%
Algebra II (2001 Revised)	11	Male	39	13	26	33.3%	66.7%
Algebra II (2001 Revised)	12	Female	16	7	9	43.8%	56.3%
Algebra II (2001 Revised)	12	Male	19	9	10	47.4%	52.6%
Geometry	09	Female	52	39	13	75.0%	25.0%
Geometry	09	Male	49	39	10	79.6%	20.4%
Geometry	10	Female	75	32	43	42.7%	57.3%
Geometry	10	Male	60	38	22	63.3%	36.7%
Geometry	11	Female	43	10	33	23.3%	76.7%
Geometry	11	Male	38	13	25	34.2%	65.8%
Geometry	12	Female	32	7	25	21.9%	78.1%
Geometry	12	Male	32	10	22	31.3%	68.8%

Urban School Division Mathematics Spring 2010 Performance: Grade and Gender

Table 2 presents the school division's mathematics performance for males and females in spring 2010 in algebra and geometry by grade level. Geometry pass/fail percentages for females range from 97% to 25% passing and 74% to 3% failing. Males passed at a range of 98% to 27% passing and 74% to 2% failing. Ranges for grade levels ninth through twelfth indicate a pass rate of 75% to 22% for females and 98% to 27% for males. Geometry SOL scores indicate a decline in grade levels for both female and male students. A review of the performance during the spring 2010 Virginia Standards of Learning Mathematics Tests indicates that the division has an overall failure rate of 72.3% with an overall passing rate of 27.7% in mathematics grades 8 – 12.

Table 2

Urban School Division Math SOL Performance: Spring 2010

Organization	Test	Grade	Gender	# of Tests	# Passed	# Failed	% Pass Rate	% Fail Rate
Total				7,482	5,413	2,069	72.3%	27.7%
Urban School Division	Algebra I	09	Female	514	429	85	83.5%	16.5%
Urban School Division	Algebra I	09	Male	501	402	99	80.2%	19.8%
Urban School Division	Algebra I	10	Female	204	143	61	70.1%	29.9%
Urban School Division	Algebra I	10	Male	295	186	109	63.1%	36.9%
Urban School Division	Algebra I	11	Female	56	29	27	51.8%	48.2%
Urban School Division	Algebra I	11	Male	80	46	34	57.5%	42.5%
Urban School Division	Algebra I	12	Female	60	34	26	56.7%	43.3%
Urban School Division	Algebra I	12	Male	65	30	35	46.2%	53.8%
Urban School Division	Geometry	08	Female	178	173	5	97.2%	2.8%
Urban School Division	Geometry	08	Male	165	162	3	98.2%	1.8%
Urban School Division	Geometry	09	Female	290	239	51	82.4%	17.6%
Urban School Division	Geometry	09	Male	256	212	44	82.8%	17.2%
Urban School Division	Geometry	10	Female	393	232	161	59.0%	41.0%
Urban School Division	Geometry	10	Male	342	195	147	57.0%	43.0%
Urban School Division	Geometry	11	Female	197	82	115	41.6%	58.4%
Urban School Division	Geometry	11	Male	177	94	83	53.1%	46.9%
Urban School Division	Geometry	12	Female	105	27	78	25.7%	74.3%
Urban School Division	Geometry	12	Male	117	31	86	26.5%	73.5%

Expressive Writing

Throughout history, writing has had an extreme influence on the feelings, thoughts, and behaviors of individuals and entire societies (Lepore & Smyth, 2006). The relationship between emotional expression and health have arisen because of provocative findings linking “expressive writing” to health (Pennebaker, 1989; Smyth & Pennebaker, 2001). Expressive writing is an intervention where individuals are asked to write about personally upsetting experiences for 15 to 20 minutes each day for several days. In randomizing experiments, the intervention has been found to produce positive effects on diverse aspects of physical and mental health, including reductions in health center visits, self-reported illness, and depressive symptoms and improvements in immune system and role functioning (Smyth, 1998). In numerous studies during the past two decades, this paradigm has produced findings positively associated with increased physical and mental health benefits (Pennebaker, 1997). In another study, Lumley and Provenzano (2003) examined expressive writings effect on academic performance of college students. The writing experiment was for four days. The study participants (n=74) were randomly assigned to an expressive writing condition writing on stress (experiment) or a writing condition on time management (control). Participants rated their mood before and after writing each day of the study. The results of the study indicated that the experimental writing condition led to improved grade point averages in subsequent semesters and improved mood.

PURPOSE

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress and mathematics anxiety using a short term expressive writing intervention. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research was explored on cognitive processes, and psychological processes, analyzing writing samples using the Linguistic Inquiry Word Count (LIWC-2001) software, to see if changes occurred as a result of writing on either a value-laden or neutral topic over three days. An additional area that was explored was to see if there was an effect on the Virginia Standard of Learning (SOL) practice scores for students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school.

Rationale

The researcher's aim was to see if stress, general anxiety and math anxiety are reduced, would there will be an improvement in Standard of Learning mathematics practice scores for students who failed mathematics at one urban high school. There have been several studies demonstrating the benefits of expressive writing with positive health outcomes; however, of the studies researched, none have explored the effects of expressive writing with adolescents in an academic environment.

Theoretical Foundation

The Expressive Writing Paradigm

Expressive writing is a brief writing intervention that has shown positive outcomes on a variety of subjects for a variety of conditions. For example, significant

benefits have been found for students' grade point averages (Pennebaker & Francis, 1996; Cameron & Nicholls, 1998; Cohen et al. 2006, and Wilson, 2006); working memory (Klein & Boals, 2001); self-reported health outcomes (Cameron & Nicholls, 1998; Park & Blumberg, 2002); and medical conditions (Smyth 1998; Rosenberg et al. 2002). Most research has involved subjects writing about traumatic, stressful or emotional events for 15-20 minutes (the maximum) over 3-5 days. In contrast, the studies by Wilson (2006) and Cohen et.al, (2006) used self-affirmations for writing. In this study, the researcher will see if a brief expressive writing intervention will improve Virginia Standard of Learning Scores (SOL) for students who have failed mathematics at one urban high school. The experimental and control group wrote over a period of three days for 15 minutes in intact classes.

The Basic Writing Paradigm (Pennebaker, 1997) involves randomly assigning each participant to one of two or more groups. Each group is tasked with writing for 15 to 30 minutes each consecutive day about an assigned topic. Participants are assigned to the experimental or control group to write about emotional or neutral topics. Typically, participants in a disclosure group write about thoughts and feelings connected to a stressful occurrence (Lepore & Smyth, 2002). Groups are compared on changes in well-being from baseline to follow-up, which is most commonly within several months of writing.

RESEARCH QUESTIONS AND HYPOTHESES

Research Question 1

What is the effect of expressive writing on stress in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

H2: There will not be a significant difference between the pretest and posttest results for the control group on stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

H3: There will not be a significant difference between group comparisons on pretest scores of stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

H4: There will not be a significant difference between group comparison posttest scores on stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

Research Question 2

What is the effect of expressive writing on general anxiety in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

H2: There will not be a significant difference between the pretest and posttest results for the control group on general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales on Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

H3: There will not be a significant difference between group comparison on pretest scores of general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

H4: There will not be a significant difference between group comparison on the posttest scores of general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

Research Question 3

What is the effect of expressive writing on mathematics anxiety in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

H2: There will not be a significant difference between the pretest and posttest results for the control group on math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

H3: There will not be a significant difference between group comparison on pretest scores of math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

H4: There will not be a significant difference between group comparison on the posttest scores of math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

Research Question 4

What is the effect of expressive writing on SOL practice mathematics test scores in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on the math test scores as assessed by the practice Standard of Learning (SOL) Test.

H2: There will not be a significant difference between the pretest and posttest results for the control group on math test scores as assessed by the practice mathematics Standard of Learning (SOL) Test.

H3: There will not be a significant difference between group comparisons on pretest math scores as assessed by the practice mathematics Standard of Learning (SOL) Test.

H4: There will not be a significant difference between group comparisons on posttest of math scores as assessed by the practice mathematics Standard of Learning (SOL) Test.

Research Question 5

What is the relationship between the predictor variables, group membership (experimental and control), stress general anxiety, math anxiety, and previous

mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students?

Hypotheses

H1: There will not be a significant relationship between the predictor variables, group membership (experimental and control) on stress, general anxiety, math anxiety, and previous mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students.

Research Question 6

Is there a significant difference within group comparison for the experimental group in the cognitive processes category in a sample of urban high school students' expressive writing samples?

Hypotheses

H1: There will not be a significant difference in the cognitive processes category of expressive writing samples from Day 1 to Day 3 for the experimental group.

H2: There will not be a significant difference in the cognitive processes category of expressive writing samples from Day 1 to Day 3 for the control group.

H3: There will not be a significant difference in cognitive processes category in expressive writing samples between the experimental and control groups.

Research Question 7

Is there a significant difference within group comparison for the experimental group in the psychological processes category in a sample of urban high school students' expressive writing samples?

Hypotheses

H1: There will not be a significant difference in the psychological processes category of expressive writing samples from Day 1 to Day 3 for the experimental group?

H2: There will not be a significant difference in the psychological processes category of expressive writing samples from Day 1 to Day 3 for the control group.

Analysis: Paired Samples t-test

H3: There will not be a significant difference in psychological processes category in expressive writing samples between the experimental and control groups.

Overview of the Study

The study used a mixed model research design. This study provided data about the effects of expressive writing on cognitive processes, stress, general anxiety, and mathematics anxiety on the Virginia Standards of Learning (SOL) mathematics practice test on a sample of urban high school students failing mathematics. The purpose of this study was to determine if either or both experimental interventions effectively reduced the anxiety and improved test performance. Students remained in intact class groups with an experimental group and a control group for a total of 93 participants ($n=93$). To detect a medium difference between two independent means at $\alpha = .05$ requires $n = 64$ in each group for power analysis. The participant count originally started with 130 participants and decreased to 93 based on noted changes. Approximately twenty-five students completed the course in summer school, one student withdrew to pursue a General Education Diploma (GED), one student pursued the job corps as an option, one student was misplaced in the class, two students transferred to another school, and one student experienced a language barrier as an English as the Secondary Language (ESL) student and six students chose not to participate. The experimental group received the expressive

writing intervention of writing on a value-latent topic and the control group wrote on a neutral topic as part of their expressive writing exercise. Both groups received pretest and posttest measures. The current study utilized the expressive writing protocol created by Pennebaker and Beall (1986). Both groups received pretest and posttest assessment on anxiety, mathematics anxiety, and stress associated with mathematics test scores. Additional pretest data was gathered on demographic information through the student data information system. Both the experimental and control group wrote over a period of three days for 15 minutes each day.

Data gathering instruments were the Pennebaker Inventory of Limbic Languidness (PILL), the Math Anxiety Rating scale (MARS), the Multiple Affect Adjective Checklist-Revised (MAACL-R), and the writing essays using the Linguistic Inquiry Word Count software (LIWC2001).

The Pennebaker Inventory of Limbic Languidness (PILL) Pennebaker (1980) measured the frequency of general physical symptoms and sensations associated with stress are experienced. The PILL is a 54 item instrument with a five point scale designed to evaluate the frequency of general physical symptoms. The PILL, used in this study, was modified by using Pennebaker's Symptom/Emotion Checklist: A State Measure to select symptoms which were common to both the checklist and the inventory and related to an adolescent population. The modified symptom inventory consisted of 20 items. High scores reflect the higher amounts of physical symptoms associated with stress and anxiety.

The Math Anxiety Rating Scale (MARS) was developed by Suinn to provide a unidimensional measure of anxiety related to number operations and other mathematical

concepts (Suinn, Edie, Nicoletti, & Spinelli, 1972). Subjects indicated the degree of anxiety produced in response to situational items by indicating a range from one to five. Total scores reflected the sum of item values. High scores reflect high anxiety associated with mathematics. Normative information for secondary high schools was obtained (Suinn & Edwards, 1982) with 197.6 being the mean MARS-A score.

Released test for the practice Standard of Learning Mathematics' Test was used which is a sample set of Standards of Learning (SOL) tests administered to Virginia public school students during the previous spring test administration released by the Virginia Department of Education. The released tests are not inclusive of all Standard of Learning tests administered during the previous year; however, the tests are representative of the content and skills assessed.

The Multiple Affect Adjective Checklist-Revised (MAACL-R), developed by Lubin and Zuckerman (1999) measured affective states and traits. The instrument incorporates three basic scales: Anxiety, Depression, and Hostility. The checklist was a form with 132 adjectives to measure the major scales and the sub-scales of Positive Affect and Attention Seeking. Designed for use with college students as a measure of test anxiety, the instrument has also been used with high school populations. Raw scores for each subscale and each composite score were converted into t-score, using the corresponding table in the Appendix of the MAACL-R manual.

Qualitative Analysis included content analysis of writing samples obtained from the experimental and control groups. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC- 2001), available for computer scoring. The LIWC- 2001 Dictionary was composed of 2,290 words and word stems. Each word or word-stem

defined one or more word categories or sub dictionaries. For example, the word 'cried' is part of four word categories: sadness, negative emotion, overall affect, and a past tense verb. Hence, if it is found in the target text, each of these four sub dictionary scale scores will be incremented. As in this example, many of the LIWC- 2001 categories are arranged hierarchically. All anger words, by definition, will be categorized as negative emotion and as overall emotion words. Each of the 74 preset LIWC 2001 categories is composed of a list of dictionary words that define that scale (Pennebaker, Francis, Booth, 2001).

LIMITATIONS

Some of the limitations to this study included:

- The short time frame for the intervention to have an effect
- Responsiveness of parents about strategy of writing
- Support of teachers to share their instructional time for the study
- Unanticipated environmental variables that may affect student's performance

Assumptions of the Study

The present study explored the effects of expressive writing, developed by Pennebaker and Beal (1986); on stress, anxiety, math anxiety, cognitive processes and psychological processes on the Virginia Standard of Learning practice mathematics scores. There is an assumption that noted variables have an effect on performance.

DEFINITION OF TERMS

Expressive Writing- exercise aimed at the emotional disclosure of thoughts and feelings about a topic. The written expression is normally for 15-20 minutes on three consecutive days.

Virginia Standards of Learning (SOL): The Standards of Learning for Virginia Public Schools describe the commonwealth's expectations for student learning and achievement in grades K-12 in the areas of English, mathematics, science, history and social science. (www.doe.virginia.gov)

Expedited Retake: SOL test taken during the same academic year, and before the next scheduled test administration, by a student who, on his first attempt, scored in a range of 375-399 on the SOL Test.

Adequate Yearly Progress (AYP): AYP is part of the federal No Child Left Behind Act (NCLB) of 2001. NCLB requires all public schools and school divisions to meet certain goals (called Annual Measurable Objectives or AMO's) to determine if schools are making "adequate progress" each year. In Virginia, these goals are determined by how students perform on the Standards of Learning (SOL) tests.

Released Standard of Learning Tests: Virginia Department of Education releases sample sets of Standards of Learning (SOL) tests that are administered to Virginia public school students during the previous spring test administration. The released tests are not inclusive of all SOL tests administered during the previous year; however, the tests are representative of the content and skills assessed.

Math Anxiety: Richardson and Suinn (1972) defined math anxiety *as feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematics problems in a wide variety of ordinary life and academic situations. Mathematics anxiety may prevent a student from passing fundamental mathematics courses or prevent his pursuing advanced courses in mathematics or the sciences. (p. 551)*

Test Anxiety: Test anxiety is one of many specific forms of anxiety. Test anxiety involves the arousal of physical and cognitive reactions during testing or evaluative situations (Cizek & Burg, 2006). High-test anxiety may be debilitating whereas moderate to low levels may be helpful to a person's performance. "Test anxiety can be interpreted as the tendency to view, with alarm, the consequences of inadequate performance in an evaluative situation" (I.G. Sarason, 1978, p.214).

Trait: The predominant feature of a trait is the lasting, enduring characteristic nature of a person.

Trait anxiety: Trait anxiety is a rather stable characteristic that has pervasive effects or is manifested in varied facets of an individual's life (Cizek & Burg, 2006).

State: A state is a temporary frame of mind or manner of behaving.

State Anxiety: State anxiety is a form of anxiety that exists in particular situations.

CHAPTER II

LITERATURE REVIEW

INTRODUCTION TO THE LITERATURE

The review of literature will begin with an overview the Virginia Standards of Learning Tests outlining division's graduation requirements, test and mathematics anxiety with academic outcome, and meta-analysis research. This review will include empirical and theoretical literature to provide a broad examination of literature relevant to the effects of expressive writing on stress, anxiety, math anxiety, cognitive processing and psychological processing.

Virginia Standards of Learning (SOL) Tests

The Virginia Standards of Learning Tests are the minimum curriculum requirements for student achievement with a rigorous state curriculum. They were developed by the State Department of Education as a response to the fact that the level of academic achievement of students in Virginia had not been adequate for graduates to compete successfully in the international job market nor to fulfill their responsibilities as citizens of Virginia and the United States for the 21st century (sbo.nn.k12.va.us/sol/questions.html).

SOL assessments measure student achievement in English, mathematics, science and history/social science. Student's mastery of skills is assessed in English and mathematics in grades 3-8 and at the conclusion of certain high school-level courses. SOL tests in science and history are administered in grades 3, 5 and 8 and at the end of high school-level courses in these subjects. Students are graded on performance sale of 0-600 with 400 representing the minimum level of acceptable proficiency and 500

representing advanced proficiency. On English reading and mathematics tests, the Board of Education has defined three levels of student achievement, which are basic, proficient, and advanced, with basic describing progress towards proficiency (www.doe.virginia.gov). Scale scores on the SOLs are 500-600 for pass/advanced, 400-500 for pass/proficient, and 0-399 indicates a failing reporting score. In high school, students scoring in the expedited category ranging between 375 and 399 are allowed to re-test during the same testing window to increase chances for passing.

The division has outlined requirements to be met for graduation. Students must pass the SOL credit based on one of two listed diploma types. Courses completed to satisfy this requirement will be at or above the level of Algebra and shall include at least two course selections from among Algebra I, Geometry, Algebra II, or other mathematics courses above the level of Algebra and Geometry, according to the division's requirements for graduation.

Credits Required for Graduation: Standard Diploma

To receive a Standard Diploma, students will earn standard units of twenty-two credits and of the standard units of credits earned, students will earn the following number of verified units of credit: English-two; mathematics-one; science-one; history/social science-one; and one additional verified unit of credit of the student's own choosing (sbo.nn.k12.va.us/sol/questions.html).

Credits Required for Graduation: Advanced Studies Diploma

To receive an Advanced Studies Diploma, students will earn the standard units of twenty-four credits and of the standard units of credits earned students will earn the following number of verified units of credit: English-two; mathematics-two; science-two;

history/social science-two; and one additional verified unit of credit of the student's own choosing (sbo.nn.k12.va.us/sol/questions.html).

The Expressive Writing Paradigm

The Expressive Writing paradigm refers to the process of applying writing as a therapeutic tool to relieve physical and psychological ailments induced by stressful or traumatic experiences (Smyth & Greenburg, 2000). The underlying premise of expressive writing is the disclosure of emotion. Sigmund Freud (1922) originally explored this premise in his work on psychoanalysis and "*The Talking Cure*." Freud explored the concept of catharsis, which is the release of emotion through talking. The expression of emotion in the therapeutic context is the common link among most therapeutic modalities, which demonstrates its significance to the therapeutic process. The mere act of disclosure may be the catalyst to most of the change that occurs in the therapeutic healing process (Pennebaker, 1997). It is the work of Pennebaker and his colleagues that developed what is known as "*The Writing Cure*", the application of writing as a tool to release emotion and disclose previously held stressors and traumas. Pennebaker and Seagal (1999) discovered that disclosure of traumatic and emotional experiences through writing has both physical and psychological benefits. Despite these health benefits, writing about traumatic and stressful life events makes people feel more unhappy and distressed in the hours after the expressive writing exercise (Pennebaker & Seagal, 1999). Most expressive writing studies replicate Pennebaker's original protocol with variations in the writing topics, the length of time that participants write and the number of days that the study is administered. Pennebaker (1997) describes the basic writing paradigm in the following manner:

The standard laboratory writing technique has involved randomly assigning each participant to one of two groups. All writing groups are asked to write about assigned topics for 3 to 5 consecutive days, 15 to 30 minutes each day. Writing is generally done in the laboratory with no feedback given. Participants assigned to the control conditions are typically asked to write about superficial topics, such as how they use their time. The standard instructions for those assigned to the experimental group are a variation of the following: "I would like you to write about your deepest thoughts and feelings about an extremely important emotional issue that has affected you and your life. The only rule is that once you start writing continue to do so until your time is up." (p. 162)

The writing paradigm in its simplicity has yielded some impressive results as an intervention with various physical and psychological ailments. Pennebaker and his colleagues, have conducted research and demonstrated the efficacy of expressive writing with: asthma and rheumatoid arthritis patients (Kelly, Lumley, & Leisen, 1997), insomnia patients (Harvey & Farrell, 2003), patients with rumination and depression symptoms (Gortner, Rude, & Pennebaker, 2006), individuals recall of collective trauma (Fernandez & Paez, 2008), and male college students with restrictive emotionality (Wong and Rochlen, 2009). Pennebaker and many other researchers have extended Pennebaker's original work on the basic writing paradigm with much success.

Research by Frattaroli, Thomas, and Lyubomirsky, 2010 looked at whether experimental disclosure through expressive writing, could improve exam performance and psychological health in students taking a graduate school entrance exam. One hundred four students (70% women, $M = 20.98$ years) scheduled to take the GRE-General ($n = 48$), MCAT ($n = 38$), LSAT ($n = 15$), GRE-Subject ($n = 2$), or Pharmacy

College Admissions Test (PCAT) ($n = 1$) were randomly assigned to write expressively about their upcoming exam or to a neutral writing condition. Measures of depressive symptoms and test anxiety before and after writing were completed by the participants, and exam scores were collected. Research indicated that the experimental disclosure group had significantly higher test scores and significantly lower pre-exam depressive symptoms than the neutral writing group. The researchers noted that benefits for depressive symptoms were found in expressive writers regardless of exam type, the advantage of expressive writing for test performance was only observed in students taking the MCAT or LSAT.

All three psychological variables (depressive symptoms, intrusive thoughts, and cognitive test anxiety) were significantly correlated (all $ps < .001$), with rs ranging from .40 to .48. At baseline, mean scores for all participants were 1.51 ($SD = 0.81$) on the Intrusive Thoughts measure and 1.55 ($SD = 2.36$) on the GHQ Severe Depression Subscale, similar to scores reported in other non-clinical college samples (Lepore, 1997; Vallejo et al., 2007). However, the mean score on the Cognitive Test Anxiety scale ($M = 60.12$; $SD = 14.56$) was lower than scores reported in two other undergraduate samples (Cassady & Johnson, 2001; Cassady, 2004).

A further analysis of the baseline characteristics revealed that, prior to condition assignment, expressive writing participants had significantly higher intrusive thoughts ($M = 16.83$, $SD = 1.04$) than neutral writing participants ($M = 13.29$, $SD = 1.16$), $t(102) = 2.28$, $p = .025$; therefore, baseline levels of intrusive thoughts were used as a covariate in all analyses involving comparisons of the writing groups. The two groups did not significantly differ on baseline SAT (or ACT-SAT equivalent) scores ($Ms = 1120.56$ and

1126.00 for the experimental and control groups, respectively, $p > .800$), with an approximate average percentile of 67th for both groups. All other baseline group differences (e.g., age, depressive symptoms) were also found to be nonsignificant (all $ps > .150$).

How Expressive Writing Works

Since the inception of expressive writing as a therapeutic intervention, the most controversial aspect has been the mechanism by which expressive writing provides health and psychological benefits. On one side of this controversy, some argue that expressive writing provides emotional catharsis. Still some argue that expressive writing stops emotional inhibition. In addition, some espouse expressive writing as a way to develop a narrative and increase cognitive processing. Yet, others posit that expressive writing's benefits are derived from the mechanism of exposure. When individuals write or talk about personally upsetting experiences in a controlled setting, consistent and significant health improvements are found. When individuals talk or write about deeply personal topic, their immediate biological responses are similar with those seen among people attempting to relax (Pennebaker & Chung, 2007).

Pennebaker (2010) shared recommendations and feedback in clinical settings when working with clients using expressive writing. Writing should be for the client and not shared with the therapist or with a group. If a client desires to share, they should be encouraged to talk about it rather than read from what they have written. Although the current study does not examine the mechanism by which expressive writing provides benefit, the researcher examined the current literature surrounding this controversy to

gain a broad understanding of the discourse and possible implications this underlying mechanism will have on the current study.

Expressive Writing Interventions

Adapting Pennebaker's expressive writing procedure (Pennebaker & Beall, 1986) for use as a homework intervention with outpatient psychotherapy patients, Graf, Gaudiano, & Geller (2008) sought to determine the possible benefits of the treatment on reductions in anxiety and depressive symptoms as well as improved overall progress in psychotherapy in comparison to a control group. The early drafts of Graf et al.'s study received comments from Dr. James Pennebaker. The exploratory findings indicate that the positive effects of the expressive writing condition could not be adequately accounted for by therapist factors.

The researchers, using a randomized controlled study, assigned outpatient psychotherapy patients to an adapted form of Pennebaker's writing intervention or to a control writing condition as part of weekly homework assignments. Subjects were drawn from a university outpatient psychiatry clinic and a student counseling center. Forty-four subjects agreed to participate and twenty-seven rejected the opportunity. Fourteen males and thirty females, with a mean age of 33.3 years. Forty-one percent of the participants were prescribed a psychiatric medication, but did they not report a medication change within six months prior to the beginning of the study. Clients self-reported their primary issues on their demographic questionnaires: depression ($n = 22$ [50%]); trauma grief ($n = 9$ [20.4%]), anxiety ($n = 7$ [15.9%]), health/medical problems ($n = 3$ [6.8%]), marital difficulties ($n = 1$ [2.3%]), and eating disorders ($n = 2.3\%$). Anxiety, health/medical

problems and depression were reported as being secondary concerns by a significant number of the participants ($n = 17$ [38.6%]).

Therapists provided psychotherapy services to the clients enrolled in the study. The Depression Anxiety Stress Scale was used to assess depression, anxiety, and stress in clinical samples during the preceding week. The Outcome Questionnaire was used to measure the participants' therapeutic progress during the study. After the three treatment sessions, the clients completed a self-report measure of homework completion, the amount of time spent writing, and the client's perceived emotional intensity of the writing topic. The Client Post-Writing Questionnaire, developed from similar items in other expressive writing studies, assessed the role of writing in the therapy sessions. The therapists completed the Therapist Post-Writing Questionnaire to assess the impact of the writing homework intervention on the therapeutic sessions.

Primary analyses, using independent-sample t tests and chi-square tests were performed to determine the differences between conditions and recruitment sites on baseline measures and client-therapist variables. A series of 2X2 repeated measures analyses of covariance were performed on the subscales of both measurements. Results, all of which were significant at $p = .05$, indicated that participants in the expressive writing condition improved more significantly than the control condition. The exploratory findings indicate that the positive effects of the expressive writing condition could not be adequately accounted for by therapist factors.

The authors suggest that written emotional disclosure may support effective problem solving strategies based on dealing with previous stressful life event experiences which may lead to improved understanding and a decline in distress related symptoms.

The study supported current research regarding the benefits of expressive writing with regard to psychological health.

Although the study validated a significant reduction in depression and anxiety symptoms in the expressive writing group compared with the control group, long term follow-up information was lacking. The authors noted the need for future research involving the use of emotional disclosure writing in conjunction with psychotherapy with the aim of improving therapeutic process and outcome.

During a study of four classes of eighth-grade students in a suburban middle school, health course were randomly assigned to write about either an emotional or neutral topic in an expressive writing intervention for adolescents' somatic symptoms and mood study conducted by Soliday, Garofolo, and Rogers (2004). Their research revealed advantages of using expressive writing as a cost efficient intervention to attend to the emotional worries of adolescents.

To assess the usefulness of a written expressive intervention on minimizing levels of distress experienced by young adolescents and to measure overall functioning improvement, the student sample population ($n= 106$) was randomly assigned to an emotional disclosure group (negative events) a control group (neutral events). The Children's Somatization Inventory (CSI) and the Somatization scale of the Youth Self-Report Inventory (YSR) subscale were used to assess somatic symptoms. The Center for Epidemiological Studies Depression Scale (CESD) and the Negative Affect (NA) subscale of the Positive and Negative Affect Schedule for Children (PANAS) were used to measure depressive symptoms. The Positive Affect (PA) subscale of the PANAS measured interest, engagement, and energy. Positive disposition was identified by the

Children's Hope Scale and the Life Orientation Test-Revised (LOT-R) assessed the potential of positive outcomes. At baseline and at a six week assessment, a medical visit self-report of the number of medical visits within the previous six weeks was requested. The Linguistic Inquiry and Word Count (LIWC-2001) program was utilized in an effort to determine the extent student writings contained emotional content. Data were collected during four intervals: baseline questionnaire; post intervention (following three consecutive daily twenty minute writing sessions); two follow ups (20 days post baseline); six week follow up (50 days post baseline). Students reported on their functioning, to some extent, at each interval.

Data generated by the measures was examined for normal distribution. Following the log transformation of CSI scores and the coding transformation of medical visits, skewness and kurtosis estimates for all measured data were within normal limits. Data from fourteen students (due to insufficient data or absenteeism), was analyzed through the use of a Chi-square analysis which uncovered no significant differences in the proportion of participants with dropped data. Study completers were younger than those with dropped data $t(115) = 2.5, p < .01$, Cohen's d (effect size) = .22 ($M = 13.5, SD = 1.1$, and $M = 13.9, SD = .5$, respectively). No significant differences between study completers and those with dropped data as determined by t test measures comparing the scores of all measures at baseline were determined. Effect sizes ranged from $d = .02$ to $d = .09$.

A MANOVA tested the effects of the expressive writing intervention on distress, positive disposition, and somatic symptoms indicating nonsignificant interactions with gender. Univariate analyses showed significant effects for the PANAS-NA scale. The

Condition X Time interaction was significant $F(3, 102) = 3.85, p = .01, \eta^2 = .05$.

Follow-up analyses demonstrated that scores remained constant from baseline to post intervention for both groups ($\eta^2 = .01$). Further follow-up analyses indicated that LOT scores increased significantly in the experimental condition only $F(1, 105) = 5.39, p = .02, \eta^2 = .05$. Somatic symptoms as measured by the PANAS-PA and the number of medical visits were nonsignificant, with effect sizes ranging from .01 to .06.

Post treatment distress scores decreased and positive disposition scores increased for the treatment condition only. Importantly, the lasting effects of the intervention over time were readily apparent. Relying on self reported somatic symptoms may have been problematic considering the age of the subjects. Without verification by parents, guardians, teachers, or registered nurses, it is difficult to determine whether reported stressors or somatic symptoms are representative of the actual indications. Concerns regarding the small effect sizes are noteworthy. Despite these and other limitations, the study highlights the possibility for using emotional disclosure interventions with an adolescent population experiencing nonclinical distress.

Expressive Writing with Non-Clinical Populations

In one of his many subsequent studies Chung and Pennebaker (2008) examined whether college students ($n=106$) writing about a life transition once per hour for three hours or three times in one hour is as effective as the traditional once per day approach to expressive writing. The findings from this study indicate that those assigned to the experimental condition evidenced fewer symptoms at the 9-month follow-up. These findings indicate that the one-hour expressive writing exercise is more emotionally demanding but is as effective as the traditional three-day writing method.

In a study looking at the effects of expressive writing about dreams that follow trauma and loss on psychology students ($n=45$), who recently experienced either significant trauma or significant loss. The authors found that expressive writing is beneficial to those who have recently experienced a trauma but not those who have experienced loss.

In a study looking at expressive writings effect on mood, cognitive processing, social adjustments and health following a relationship breakup with female undergraduate students ($n=73$). Participants in the experimental group were more likely to reunite with their ex-partners (Lepore and Greenberg, 2002). The researchers suggested that expressive writing influences social adjustment. This study supports previous studies findings that demonstrate that expressive writing allows individuals to make meaning of previous unresolved life stressors by disclosing the details of the situations. One limitation to this study was that the researchers did not address the mechanism through which expressive writing enhances social adjustment.

In a study looking at the effects of expressive writing on maladaptive rumination in a population of first year college students ($n= 69$). Participants were randomly assigned to either and expressive writing condition ($n=35$) or a control writing condition ($n=34$). Participants in both conditions wrote continuously for twenty minutes each session on three consecutive days. The study's findings showed that participants in the expressive writing condition showed a change in the depression symptoms versus those in the control condition, which demonstrated no statistically significant change in depression symptoms. The study design followed the typical protocol for expressive writing. In another study, Lumley and Provenzano (2003) examined expressive writings effect on

academic performance of college students. The writing experiment was for 4 days. The study participants (n=74) were randomly assigned to an expressive writing condition writing on stress (experiment) or a writing condition on time management (control). Participants rated their mood before and after writing each day of the study. The results of the study indicate that the experimental writing condition led to improved grade point averages (GPAs) in subsequent semesters and improved mood.

The review of these studies suggests that clinical as well as non-clinical populations can benefit from expressive writing. The present study will explore expressive writing's effect on five constructs that have been correlated with successful academic outcome: stress, anxiety, math anxiety, cognitive processes and psychological processes. In studying the effects of expressive writing on the listed constructs, this study will add to the body of research on expressive writing as an intervention with non-clinical populations.

THE PSYCHOLOGICAL MEANING OF WORDS

Earlier theorist and clinicians note that stressful experiences can affect health with emphasis on cognitive processes. Memories of stressful events are organized at the perceptual level, as fragmented and disorganized sensations such as sounds, images, and feeling states that are similar to those that company the original event. The work of theorist such as Janet (1919) elaborate on how cognitive and emotional processes mediate the health effects of writing about stressful experiences (Lepore & Smyth, 2002).

Pronoun and verb tense are useful linguistic elements that can help identify focus, with, in turn, can show priorities, intentions, and processing. The degree to which people express emotion, how they express emotion, and the valence of that emotion can tell us

how people are experiencing the world. Research suggests that LIWC accurately identifies emotion in language use. For example, positive emotion words (e.g., love, nice, sweet) are used in writing about a positive event, and more negative emotion words (e.g., hurt, ugly nasty) are used in writing about a negative event (Kahn, Tobin, Massey, & Anderson, 2007).

Words provide information about social processes which has more status, whether a group is working well together, if someone is being deceptive, and the quality of a close relationship. Word choice provides information about person perception (Semin & Fiedler, 1988). Word count explains who is dominating the conversation and how engaged they are in the conversation. Assents and positive emotion words measure levels of agreement. Thinking can vary in depth and complexity; this is reflected in the words people use to connect thoughts. Language changes when people are actively reevaluating a past event. It can also differ depending on the extent to which an event has already been evaluated.

Depth of thinking can vary between people and situations; certain words can reveal these differences. Cognitive complexity can be thought of as a richness of two components of reasoning: the extent to which someone differentiates between multiple competing solutions and the extent to which someone integrates among solutions (Tetlock, 1981). These two processes are captured by two LIWC categories—exclusion words and conjunctions. Exclusive words (e.g., but, without, exclude) are helpful in making distinctions. Indeed, people use exclusion words when they are attempting to make a distinction between what is in a category and what is not in a category. Exclusive words are used at higher rates among people telling the truth (Newman et al., 2003).

Conjunctions (e.g., and, also, although) join multiple thoughts together and are important for creating a coherent narrative (Graesser, McNamara, Louwerse, & Cai, 2004).

Prepositions (e.g., to, with, above), cognitive mechanisms (e.g., cause, know, ought), and words greater than six letters are all also indicative of more complex language.

Prepositions, for example, signal that the speaker is providing more complex and, often, concrete information about a topic. “The keys are *in* the box *by* the lamp *under* the painting.” Within published journal articles, authors use more prepositions in the discussion than the introduction or abstract. Discussions are often the most complex part of an article because results must be integrated and differentiated from past findings (Hartley, Pennebaker, & Fox, 2003).

The use of causal words (e.g., because, effect, hence) and insight words (e.g., think, know, consider), two subcategories of cognitive mechanisms, in describing a past event can suggest the active process of reappraisal. In a reanalysis of six expressive writing studies, Pennebaker, Mayne, and Francis (1997) found that increasing use of causal and insight words led to greater health improvements. This finding suggests that changing from not processing to actively processing an event in combination of emotional writing leads to better outcomes. In these experiments, increasing use of casual and insight words may be analogous to making reconstrual statements. In other work, use of reconstrual in combination with discussion of traumatic events has shown to have the best health outcomes (Kross & Ayduk, 2008). Participants in describing a painful relationship breakup used more cognitive mechanisms, particularly causal words, in describing the breakup and post breakup compared with the pre-breakup (Boals & Klein, 2005). The authors argue that causal words are used in the most traumatic parts,

the breakup and post-breakup, because they are being used to create causal explanations to organize the participant's thoughts.

The language that people use to discuss an event can reveal something about the extent to which a story may have been established or is still being formed. When people are uncertain or insecure about their topic, they use tentative language (e.g., maybe, perhaps, guess) and more filler words (e.g., blah, I mean, you know). Participants who recounted an event that they had already disclosed to someone else used fewer words from the tentative category than participants who recounted an undisclosed event (Pasupathi, 2007).

Possibly, higher use of tentative words suggests that a participant has not yet processed an event and formed it into a story. Similarly, Beaudreau, Storandt, and Strube (2006) found that in recounting a personal story younger participants used more filler words compared with older participants. However, there was no difference in filler words when the two groups described a story based on a picture. In this experiment, use of filler words may suggest the degree to which the story was well formed, presumably older participants had more perspective on the personal life events and may have recounted them many more times than the younger participants.

Individual Differences

The self-focus, cognitive complexity, social references, and emotional tone inherent in language use can help identify individual differences. These linguistic characteristics differ with age, sex, personality, and mental health. Language use, like any behavioral manifestation, can reflect individual differences. These language features can

be used to make predictions about individuals and also may underlie causal processes that create some individual differences.

As people age, they become less self-focused, refer more to the moment, and do not decline in verbal complexity. Pennebaker and Stone (2003) examined the writing of participants of varying ages in emotional writing studies. In a second experiment, the authors examined the text of published authors from the span of their writing career. Across these two studies, first-person singular decreased with time, whereas insight words, future tense verbs, and exclusive words increased. The authors observe these patterns of language use both in studies of different individuals at different points in their lives, and of authors over the course of their life. From the results, they reason that there are shifts in self-focus as people age and, counter to expectations, attention to time is more present and future oriented, and verbal complexity may increase or at least stay the same as people age, evidenced by insight words and exclusive words.

Emotionality: Positive and Negative Emotions

The degree to which people express emotions and how they express emotions can tell what they are experiences (Tausczik & Pennebaker, 2010). Use of emotion words has also been used as a measure of the degree of immersion found that among women trying to cope with intimate partner violence, using more positive and negative emotion words to describe the violence led to increase feelings of physical pain over the four writing sessions. The authors concluded that higher use of emotion words showed more immersion in the traumatic event, which led to an increasing of physical pain (Holmes, D., Alpers, G. W., Ismailji, T., Classen, C., Wales, T., Cheasty, V., et al., 2007).

Disclosure is a powerful therapeutic agent that may account for a substantial percentage of the differences in the healing process. Writing or talking about emotional experiences, rather than writing about superficial control topics, has been found to be associated with significant drops in physician visits from before to after writing among relatively health samples (Pennebaker, 1997).

History of Stress Concept

The concept of stress was originally used in the field of engineering to measure the capacity of metal, wood or concrete to with stand strain (Parker, 1961). A new use of this concept was studied by Hans Selye in his book, *The Stress of Life* (1956). In his landmark research on stress he discovered the stress syndrome and defined stress as the adaption to a threatening event. Selye later published, "*Stress without Distress*." in this work, Selye (1974) defined stress as "The nonspecific response of the body to any demand made upon it" (p. 14). Many other theorists have developed definitions of stress but there is not an agreement on one definition of stress. Dunham (1992) defined stress as "a process of behavioral, emotional, mental and physical reactions caused by prolonged, increasing or new pressures which are significantly greater than coping resources" (p.3). Whereas Lazarus (1986) defined stress as a system of variables that are interdependent rather than unidimensional. Lazarus (1986) put forth the concept that stress is dependent upon the relationship between the individual and a particular environment. Without a consensus on the definition of stress there is wide agreement that stress can have a negative physical and psychological effect on the body. One of the most prevalent factors effecting student well being and academic outcome is stress.

Test Anxiety

Early studies in the area called attention to individually differing testing situation reactions experienced by students (Luria, 1932) and supposed that these intense emotional reactions stemmed from traumatic childhood experiences (Neumann, 1933, as cited in Spielberger & Vagg, 1995). Brown (1938a, 1938b) and his colleagues offered the first psychometric instrument for identifying students, who are test anxious, and noted potentially serious consequences of test anxiety (e.g., suicide). In 1951, McKeachie, in a series of studies, reported that when provided with an opportunity to comment on multiple choice test questions, students felt less anxious. McKeachie and his colleagues also reported that poor test performance may be explained by poor study habits and diversity in ability levels. S.B. Sarason and other investigators found that test anxious students were affected by test instructions and information regarding failure (Doris & Sarason, 1955; Mandler & Sarason, 1952; S.B. Sarason et al., 1960; 1952). Furthermore, I. G. Sarason's earlier work (1958) revealed that students performed less effectively when testing situations were associated with achievement. These early studies generally concluded that test anxious students performed better on exams when anxiety during examinations was reduced. As Spielberger (1972), (Liebert and Morris (1967) addressed, however, these early studies considered physiological responses but neglected to take emotional states, personality traits, and the components of worry and emotionality into account. Later studies more clearly specified behaviors interfering with test performance.

McDonald's review of text anxiety literature focusing on prevalence rates and educational effects found that studies involving child populations replicated the vast body of test anxiety knowledge. In contrast to earlier reviews (Hembree, 1988; Seipp, 1991),

McDonald's focused solely on students required by compulsory attendance to attend school. Test anxiety was generally defined as trepidation over negative evaluation involving cognitive and emotionality components. The frequency of testing and related feedback increased as children progressed through the grade levels. McDonald also reported, based on the studies he reviewed, that students increasingly compared their performances with peers as they aged. The assessment of test anxiety frequency and severity among student populations were conducted by comparing test-related fears to other potentially stressful events which were categorized or by examining test anxiety level score means. With specific regard to test anxiety and test performance, McDonald noted that most, but not all studies revealed a connection between test anxiety and performance. Overall, the correlation between the two factors was modest. Test anxiety significantly predicted overall grades and test performance, but not performance based on class work participation or essay exams. The level of test anxiety was influenced by mediating factors including individual characteristics and testing environmental interactions. Methodologically, attainment measure clarifications and control measures of ability without the influence of test anxiety warrant further consideration. Over the last several decades, researchers have underscored the adverse effect of test anxiety on student performance, apart from the students' previous academic achievement (McDonald, 2001).

High test anxious individuals have a tendency to view testing environments as more threatening or dangerous than low anxious persons (Ziedner, 1998). Numerous factors including the situational demands and restrictions, personal history of similar experiences, understanding of possible consequences, individual aptitude, skill, and

personality trait variations account for differences in threat interpretations (Zeidner, 1998). High test anxious individuals experience physiological changes (e.g., increased heart rate) and the negative emotional reactions of state anxiety, triggering them to attempt to avoid or minimize the testing threat, depending on the degree to which a test is viewed as being threatening (Spielberger, 1995). Furthermore, Spielberger (1995), conceptualized test anxiety as a situation-specific personality trait affecting the emotional and cognitive processes.

State and Trait Anxiety

Differentiating between general state anxiety and general trait anxiety deepens the understanding of how and why youth experience anxiety. Anxiety should be considered as being a dimensional construct and state and trait anxiety as multidimensional according to Endler and Kocovski (1999). The authors compared the distinction between trait and state anxiety with the distinction between potential and kinetic energy. As defined by Cizek and Burg (2006), a state is a temporary experience, and a trait is a lasting personal characteristic.

General anxiety, as described by May (1977), is based on a threat to an essential value that a person closely associates with his or her personality. Spielberger conceptualized state anxiety and trait anxiety (1995) and expanded his earlier distinction of the two constructs to consider individual differences in anxiety susceptibility as accounted for by one's personality trait. Trait anxiety is viewed as a comparatively established personality characteristic. Therefore, trait anxiety was defined by Spielberger as an individual's predisposition to react and state anxiety as a changing emotion

influenced by physiological distress and an awareness of feelings of apprehension, trepidation, and stress.

The international literature widely accepts that anxiety disorders are prevalent and demonstrate significantly varied patterns as Somers, Goldner, Waraich, and Hsu confirm in their review of the prevalence and incidence studies of anxiety disorders (2006). The majority of studies restricted to the adult population reviewed by Somers, et al., (2006) revealed that anxiety disorders are twice as widespread among women and indicated “a burden of illness” associated with anxiety disorders reported overall. Investigations of anxiety disorders among children and adolescents also consistently demonstrate the prevalence of anxiety disorders and related distress and impairment and advances are helping to close the gap between what is known and what remains to be learned (Ollendick et. al, 1994). The study of longitudinal data is substantiated by a review of the literature concentrating on anxiety disorders, trait anxiety, test anxiety, fears and worries, among ethnic minority children and adolescents in the United States conducted by Saffren, et al. (2000).

MATHEMATICS ANXIETY

Mathematical understanding and high school assessments provide adolescents with skills and experiences that pave the way to both college and careers (Brown & Conley, 2007). High stakes circumstances or stressful environments may negatively undermine math performance when monetary and social consequences are linked with poor performance (Beilock, 2008). Given laboratory situation-induced pressures, Beilock (2008) established that individuals most likely to succeed in low stress situations are often the ones most apt to fail in demanding situations. Students affected

by math anxiety may hinder their progress in learning mathematical concepts and their academic performance (Frenzel, Pekrun, & Goetz, 2007; Ryan & Ryan, 2005; Hembree, 1990). As students become less anxious about their math performance, they may make less careless mistakes on the various types of computations (Beilock, 2008), their test scores may improve, and they can be better prepared for the future while experiencing more confidence in their approach to learning.

Math anxiety interrupts cognitive processing by conceding working memory activity (Ashcraft, 2002; Beilock, 2008), offering some understanding about poor performance and individual differences in experiences with math anxiety. Highly anxious students in stressful situations may be more susceptible to unwanted failure in math despite often showing competency in other areas (Beilock, 2008). Math anxiety and overall intelligence is only weakly related given the minor correlation of $-.17$ between math anxiety and intelligence, especially when the quantitative aspect of intelligence testing is considered (Ashcraft, 2002).

Math anxiety is consistently related to math performance (e.g., Hembree, 1990; Liebert & Morris, 1967; Hsiu-Zu, Senturk, Lam, Zimmer, Hong, & Okamoto, 2000). Researchers have found correlations commonly within the $-.11$ to $-.36$ range, a small negative relationship pointing out that students with higher levels of math anxiety are inclined to have lower levels of math performance (e.g., Hembree, 1990; Ma, 1999). Math anxiety, according to numerous studies (e.g., Hembree, 1990; Liebert & Morris, 1967; Ma, 1999; Betz, 1978), has been found to have a consistent but small negative relationship with math achievement with students experiencing high levels of math anxiety performing at lower mathematic levels academically.

Ma's (1999) meta-analysis considered twenty six studies on the relationship between math anxiety and math achievement among elementary and secondary level students. The purpose of Ma's study was to determine the degree of significance between math anxiety and math achievement. Additionally, Ma aimed to determine the permeability of the relationship in response to the moderating variables gender, grade level, ethnicity and assessments to measure anxiety and achievement.

Ma and Xu (2004) attempted to find out the causal ordering between mathematics anxiety and mathematics achievement using data from the Longitudinal Study of American Youth (LSAY). A probability sample of fifty two public middle and high schools from throughout the United States representing various geographic regions and community types offered improved generalizability. Approximately sixty students from grade seven in each of these schools were randomly selected and followed for six years. The total sample of 3116 students included 1626 boys and 1490 girls. The students completed achievement tests in mathematics and science and completed a questionnaire with a mathematics anxiety measure.

The study examined math anxiety and math achievement to determine a possible causal direction. Two five-point Likert-type scale self-report questions were used to identify the presence of math anxiety. The math achievement test in the LSAY evaluated basic skills, algebra, geometry, and quantitative literacy. Gender was obtained from the student questionnaires to examine causal effects.

Consistent significant associations, across grade levels, between prior poor math achievement and later math anxiety have been demonstrated by Ma and Xu (2004) using structural equation modeling. Prior math achievement and later math achievement were

significantly related across the six grade levels (from 0.91 to 0.98) whereas the stability effects for prior math anxiety on later math anxiety were weaker (0.39 to 0.57). However, the stability effects for math anxiety became more pronounced from grade eight (0.55 to 0.59) and impacted later math anxiety consistently across later grade levels. Prior high levels of math anxiety relating to later poor math achievement were not statistically significant beginning with the ninth grade. In spite of these findings, prior poor math achievement was related to high math anxiety across all junior and senior high school grade levels, most notably for males. However, a similar relationship was noted for girls during junior high and senior high transition periods only. The notable exception was the more reliably stable relationship between females and math anxiety than males and math anxiety.

A critical problem within this study is that the measurement of test anxiety was not a specific anxiety scale that explicitly evaluates test anxiety, which has been shown to be better at measuring test anxiety (Alpert & Haber, 1960) than merely the two items on the questionnaire in the LSAY. Ma and Xu note that this limitation may account for the relatively low test-retest coefficients observed for math anxiety compared with math achievement measures which contained multiple items embedded in several subscales. The measurements of math achievement may have been impacted by test anxiety themselves, thus revealing some of the complexities involved with studying test anxiety and academic performance. Additionally, the multidimensionality of math anxiety, an important consideration (Baloğlu & Koçak, 2006) was not taken into account in Hembree's (1990) findings for math anxiety treatments, as part of a meta-analysis of 151 studies, focused on reducing anxiety levels and improving academic performance. An

average correlation of $-.34$ was reported for a student population, illustrating that math anxiety significantly affects mathematical performance and that achievement gains are coupled with diminished anxiety. Classroom interventions, behavioral and cognitive psychological treatments, and cognitive-behavioral treatments were analyzed. Classroom interventions (e.g., curricula modifications, instructional strategies, and specialized equipment) and whole class psychological treatments were not found to be associated with a reduction in math anxiety. Systematic desensitization, anxiety management training, and conditioned inhibition are behavioral treatments, which often included relaxation training, which was highly effective in lowering levels of math anxiety. Cognitive faulty belief restructuring treatments were moderately effective approaches. The cognitive restructuring treatment combined with desensitization or relaxation training was comparably as effective as desensitization alone.

According to the Third International Mathematics and Science Study (TIMSS), American students' math performance start going down during middle school. One criticism is that mathematics curriculum has too many topics taught with not enough depth. In order to see changes, teachers need to learn how to connect young people's to the use of abstract thinking and problem solving. Math has to be more than computations; it has to be an arena of investigation in order for students to understand and like mathematics (Newby, 2004).

In order to meet the changing demands of lesson delivery, teachers are using more interactive and virtual methods. According to the National Council of Teachers of Mathematics (NCTM), we need to be aware of technology use and question the effects technology has in helping students to learn more mathematics and the extent to

which it is learned (Bos, 2009). When viewing educational technology applications, six formats are noted by Bos (1) game format, (2) informational format, (3) quiz format, (4) format using virtual manipulatives, (5) static calculation format and (6) interactive math object format that uses multiple representations. With the various deliveries for instruction, cognitive and mathematical cognitive abilities must be considered.

Mathematical fidelity, according to Ziek, Heid, Blume, and Dick (2007), refers to mathematical accuracy and understanding of concepts. Cognitive fidelity refers to whether the actions performed make sense and add depth of understanding and meaning. Cognitive fidelity allows one to make connections by seeing developing patterns that are only possible through processing in the mind (Bos, 2009). The use of technology, according to Bos, (2009) should be considered based on students better understanding the material and prove to be mathematically reliable.

Math anxiety may pose a concern for career and technical educational students because many students suffering from math anxiety have little confidence in their ability to do math, and tend to take a minimum number of required math courses; this limits their career choice options (Scarpello, 2007). It is also noted by Scarpello, that math anxiety can begin as early as grade four and increases during middle and high school which can be caused by past classroom experiences, parental influences, and remembering poor past math performance.

In a study by Fuchs, Bahr, and Rieth (2001) assessing math performance of adolescents with learning disabilities and the effects of assigned versus self-selected goals delivered during computer –assisted math computation drill and practice sessions. Math computation performances were measured during a pre, mid, and post treatment.

Analyses of variance indicated that students who selected their goals performed better than pupils with assigned goals. Results suggest that students with learning disabilities in goal selection may increase their level of commitment to the learning task and may improve their level of performance. Shapka, Domene, and Keating (2006), looked at math being a filter in career aspirations. It was noted that math achievement shaped careers of students from grade nine through their post secondary schooling.

Mathematics Related Anxiety

Mathematics anxiety is linked with test anxiety through a common concern for testing situations. Unlike the test anxiety construct, math anxiety does not have a theoretical foundation. Math anxiety, lacking an independent theoretical base, is often conceptualized within the theoretical support of test anxiety (Hembree, 1990). Math anxiety may be viewed as a focused, subject specific form of test anxiety according to many researchers (e.g., Hembree, 1990; Richardson & Woolfolk, (1980); Bandalos, Yates, & Thorndike-Christ, 1995). Furthermore, Bandalos, Yates, and Thorndike-Christ (1995) described math anxiety as an amalgamation of test anxiety, poor self-confidence, a fear of failing, and a perceived negative attitude toward learning math. Theoretical models of the association between math anxiety and math performance have been difficult to establish. Although the theoretical foundations and causes of math anxiety are not firmly established, students with high levels of math anxiety are known to experience negative reactions to mathematical content and testing (Richardson & Woolfolk, 1980). A negative relationship between higher levels of anxiety and lower levels of achievement is apparent to many researchers (Hembree, 1990; Ma, 1999).

Math anxiety, though lacking a single cause (Jain & Dowson, 2009), may have numerous significant effects including math avoidance during high school and college (Betz, 1978; Dew, Galassi & Galassi, 1984) which may interfere with preparation to compete globally given the current emphasis on mathematics (Furner & Duffy, 2002; Rapee, et al., 2000) in college and career preparation. Career paths are shaped by math curricular choices; background dispositions and the suitability of math class enrollment that achieved grades communicate (McFarland, 2006). Correlations between math anxiety and other factors (e.g., motivation and self-confidence in math) are robustly negative, ranging between $-.47$ and $-.82$ (Ashcroft, 2002). Highly math anxious students tend to shun math related high stakes testing, career paths, and professions (Scarpello, 2007; Beilock, 2008; Ashcroft, 2002). These otherwise intelligent and capable individuals circumvent opportunities, which may have proved rewarding.

Test Anxiety and Academic Achievement

A variety of school related factors are negatively associated with anxiety including poor sleep (Mayers, Grabau, Campbell, & Baldwin, 2009), school connectiveness (Shochet, Dadds, Ham, & Montague, 2006), and school refusal (McShane, Walter, & Rey, 2001). Test anxiety is generally understood to be associated with lower academic performance (Zeidner, 1998) and diminished grade point average (GPA), on the basis of an extensive body of literature investigating American primary and secondary level students (Blanding, Takahashi, Silverstein, Newman, Gubi, & McCann, 2005). Meta-analyses have shown a correlation of -0.23 between test anxiety and academic achievement measures (e.g., Hembree, 1988; Seipp, 1991). In his meta-analyses of students from the United States, Hembree (1988) found that test anxiety

negatively impacted student performance at every educational level. Overall, the vast amount of empirical research on the test anxiety and cognitive performance shows a relatively modest inverse relationship between the correlates (Zeidner, 1998). Test anxiety theory generally views test anxiety as being an interfering agent, blocking the focus and retrieval of relevant information (Naveh-Benjamin, Lavi, McKeachie, & Lin 1997; Wine, 1971).

Hong's 1999 study tested two hypothesized test anxiety relationship models; perceived test difficulty, and test performance observed immediately before and after a final examination. Two hundred and eight undergraduate students completed modified versions of the Test Anxiety Inventory (TAI: Spielberger, 1980) to measure their worry and emotionality levels during the time of their final exam. In this structural model, perceptions regarding the test difficulty level had a significant effect on worry arousal and emotionality arousal. According to the temporal model, test difficulty was perceived before and after the exam with the greatest effect on test anxiety occurring during the exam. The perceived test difficulty level did not directly impact test performance, but the construct of worry, aroused by test difficulty perception, impacted exam performance.

Hong's findings suggest students' test difficulty perceptions and the actual exam difficulty level both significantly related to test anxiety. High test-anxious undergraduate students performed worse on end of course exams than high test anxious students who were tested at staggered retention intervals after the course and performed as well as other students (Naveh-Benjamin, et al., 1997). The importance of retaining knowledge gained by students and the influence of individual differences was thoroughly studied. Two hundred and ten undergraduate students with differing levels of test anxiety were

evaluated at retention intervals up to seven years in this longitudinal study. Although the results showed that high test anxious students performed worse on course exams than other students but tested similarly to other students at various retention intervals.

Seemingly, high test anxious students have the cognitive organizational structure and the applicability to respond to test questions in a similar fashion to other students, yet test anxiousness impacts their achievement level as evidenced by lower initial course exam scores.

In an earlier study (1981), Naveh-Benjamin, McKeachie, Holinger, and Lin demonstrated the negative relationship between test anxiety with overall course grade and grade point average. Test anxiety was observed to be the result of worry due to poor test taking skills. This important study however, consisted of a small sample ($n = 48$) of college level students. This study reviewed literature relevant to the relationship between test anxiety and academic performance among adolescents attending an urban high school. For a wide-ranging review of the test anxiety literature, McDonald, 2001; Spielberger and Vagg, 1995; Zeidner, 1998, Zeidner and Mathews, 2005; Cizek and Burg, 2006, and Hembree, 1988. The literature reviews conducted by the authors revealed several areas that warranted a more thorough examination. These areas were the causal relationship between test anxiety and academic performance, ethnic minority youth and test anxiety similarities and differences with relation to European American populations, school performance factors (e.g., attendance, behavior, motivation, math-related anxiety, and teacher characteristics), and gender similarities and differences regarding anxiety experiences.

CHAPTER III

METHODOLOGY

PURPOSE

The purpose of this mixed method model research design was to study the effects of an expression writing intervention on anxiety, stress and mathematics anxiety using quantitative research. Qualitative research involved a content analysis of the experimental group's writing samples provided invaluable information about the students' cognitive processes and psychological processes by analyzing writing samples. The researcher investigated whether there would be an improvement in Virginia Standard of Learning (SOL) mathematics scores for students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school. There have been several studies demonstrating the benefits of expressive health outcomes; however, of the studies researched, none has explored the effects of expressive writing with adolescents in an academic environment. The expressive writing samples were analyzed and the researcher conducted a qualitative analysis on the student's writing samples using the LIWC-2001 software to gather information about their cognitive and psychological processes.

RESEARCH DESIGN

The current study proposed mixed method experimental design. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research was explored on cognitive processes, and psychological

processes, analyzing writing samples, to see if changes occurred as a result of either emotional or neutral writing over three days. An additional issue that was explored was to see if there was an effect on the Virginia Standard of Learning (SOL) practice scores for students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school. There have been several studies demonstrating the benefits of expressive writing on health outcomes; however, none were found that explored the effects of expressive writing with adolescents in an academic environment. The expressive writing samples were analyzed using the Linguistic Inquiry Word Count (LIWC-2001) software to gather information about their cognitive and psychological processes.

Creswell (2009) notes there are more insight to be gained using both methods and the combination of methods provides an expanded understanding of research problems. In quantitative research the researcher's goal is to disprove a null hypothesis through manipulating and controlling variables, transforming data into numbers, analyzing results statistically and attempting to generalize the results to the members of the population being studied. This method also allows the researcher an opportunity to test objective theories by examining relationships among variables which can be measured by instruments. The researcher identified a sample population with the basic intent of testing the impact of a treatment or an intervention, on an outcome.

Qualitative research involves the researcher going to the site to record or collect information in its natural setting using the phenomena method of data collection. The researcher collected data by going to the computer lab where the students attended and had them to participate in a writing intervention utilizing the Linguistic Inquiry and Word

Count (LIWC-2001) for the content analysis. Qualitative research was explored on cognitive and psychological processes, analyzing writing samples, to see if there is an improvement in Virginia Standard of Learning (SOL) scores for students who were considered to be at risk because of previous academic achievement in mathematics at an urban high school. The expressive writing samples were analyzed and the researcher conducted a qualitative analysis on the student's writing samples using the LIWC-2001 software to gather information about their cognitive and psychological processes.

In a study done by Frattaroli, Thomas, and Lyubomirsky (2009) the Effects of Expressive Writing on Graduate School Entrance Exam Performance was examined. The study sought to determine if experimental disclosure could improve exam performance and psychological health in students taking a graduate school entrance exam. Students preparing for the GRE, MCAT, LSAT, or PCAT were randomly assigned to write expressively about upcoming exam they were taking or to write about a neutral topic. Participants completed measures of depressive symptoms and test anxiety before and after writing, and exam scores were collected. During this study, the experimental disclosure group had significantly higher test scores and significantly lower pre-exam depressive symptoms than the neutral expressive writing group. The researchers noted although benefits for depressive symptoms were found in expressive writing group regardless of exam type, the advantage of expressive writing for test performance was only observed in students taking the MCAT or LSAT. Participants in this study consisted of one hundred four students (70% women, $M=20.98$ years) scheduled in the following tests: GRE ($n=48$), MCAT ($n=38$), LSAT ($n=15$), GRE-Subject ($n=2$) or Pharmacy College Admissions Test (PCAT) ($n=1$).

The expressive writing and neutral writing essays were analyzed for total number of words used, positive emotions words (e.g., happy, love) negative emotion words (e.g., sad, hate), causation words (e.g., because cause), insight words (e.g., understand, realize) and time-related words (e.g., hour, minute) using the Linguistic Inquiry Word Count (LIWC; Pennebaker, Francis, & Booth, 2001). Results were successful with expressive writers (who were asked to express their deepest thoughts and feelings) writing more positive emotion words, negative emotion words, causation words, and insight words and wrote significantly fewer time-related words than those who wrote on neutral topic. The neutral writers were asked to write about time management (all $ps < .001$). However, no significant group differences emerged in total word usage ($p=.606$).

In a study done by Epstein, Sloan, and Marx, (2006) content analysis of a written disclosure using 94 college students with a mean age of 20.9 years ($SD=4.8$) was reviewed. Participants were randomly selected (within gender) to either the written disclosure condition ($n=51$) or the control writing condition ($n=43$). The participants assigned to the written disclosure group wrote about highly personal and upsetting experiences. The written essays for each session were converted to a computer text file, and the linguistic analysis of these text passages was conducted using the LIWC 2001. The linguistic indices examined in this study were negative emotion (e.g., sad, afraid, hate, worthless), positive emotion (e.g., happy love, pride), and insight/causality (e.g., think, know, because). These categories were selected based on anticipated gender differences in word use.

Pennebaker, et al. (1990), utilized content analysis to identify the characteristics of the essays of one hundred thirty students recruited from two large introductory

psychology courses. They wrote about coming to college or superficial topics. Three independent judges checked whether each essay dealt with each of the 30 different categories. All essays were coded for raw number of words and percentage of total words that were personal self-references, negations such as not and no, positive emotion words, negative emotions words, and mark-outs. The means of the various word categories were subjected to 2(condition) x 4 (wave) between -subject analysis of variance (ANOVAS). There were no differences in raw number of words or number of mark-outs, subjects in the experimental condition used more personal self-references (11.8% vs. 8.5%), $F(1,119) = 41.6, p < .01$; negations (2.2% vs. 0.4%), $F(1,119) = 196.8, p < .01$; positive emotion words (0.30% vs. 0.04%), $F(1,119) = 62.5, p < .01$; and negative emotion words (1.0% vs. 0.2%), $F(1,119) = 64.9, p < .01$, than subjects in the control condition.

RESEARCH QUESTIONS, HYPOTHESES AND DESCRIPTION OF ANALYSES

What is the impact of a short term expressive writing intervention on the Standard of Learning practice mathematics test, on general anxiety, mathematics anxiety, and stress related to physical symptoms for performance on the SOL mathematics practice test for a sample of high school students at one urban high school.

Research Question 1

What is the effect of expressive writing on stress in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

Analysis: Paired Samples t-test

H2: There will not be a significant difference between the pretest and posttest results for the control group on stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

Analysis: Paired Samples t-test

H3: There will not be a significant difference between group comparisons on pretest scores of stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

Analysis: One-Way Analysis of Variance (ANOVA)

H4: There will not be a significant difference between group comparison posttest scores on stress as assessed by the Pennebaker Inventory of Limbic Languidness (PILL).

Analysis: One-Way Analysis of Covariance (ANCOVA)

Research Question 2

What is the effect of expressive writing on general anxiety in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

Analysis: Paired Samples t-test

H2: There will not be a significant difference between the pretest and posttest results for the control group on general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales on Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

Analysis: Paired Samples t-test

H3: There will not be a significant difference between group comparison on pretest scores of general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

Analysis: One-Way Analysis of Variance (ANOVA)

H4: There will not be a significant difference between group comparison on the posttest scores of general anxiety as assessed by the Multiple Affect Adjective Check List (MAACL-R) sub-scales Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS.

Analysis: One-Way Analysis of Covariance (ANCOVA)

Research Question 3

What is the effect of expressive writing on mathematics anxiety in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

Analysis: Paired Samples t-test

H2: There will not be a significant difference between the pretest and posttest results for the control group on math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

Analysis: Paired Samples t-test

H3: There will not be a significant difference between group comparison on pretest scores of math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

Analysis: One-Way Analysis of Variance (ANOVA)

H4: There will not be a significant difference between group comparison on the posttest scores of math anxiety as assessed by the Math Anxiety Rating Scale-Adolescents (MARS-A).

Analysis: One-Way Analysis of Covariance (ANCOVA)

Research Question 4

What is the effect of expressive writing on SOL practice mathematics test scores in a sample of urban high school students?

Hypotheses

H1: There will not be a significant difference between the pretest and posttest results for the experimental group on the math test scores as assessed by the practice Standard of Learning (SOL) Test.

Analysis: Paired Samples t-test

H2: There will not be a significant difference between the pretest and posttest results for the control group on math test scores as assessed by the practice mathematics Standard of Learning (SOL) Test.

Analysis: Paired Samples t-test

H3: There will not be a significant difference between group comparisons on pretest math scores as assessed by the practice mathematics Standard of Learning (SOL) Test.

Analysis: One-Way Analysis of Variance (ANOVA)

H4: There will not be a significant difference between group comparisons on posttest of math scores as assessed by the practice mathematics Standard of Learning (SOL) Test.

Analysis: One-Way Analysis of Covariance (ANCOVA)

Research Question 5

What is the relationship between the predictor variables, group membership (experimental and control), stress general anxiety, math anxiety, and previous mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students?

Hypotheses

H1: There will not be a significant relationship between the predictor variables, group membership (experimental and control) on stress, general anxiety, math anxiety, and previous mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students.

Analysis: Standard Multiple Regression

Research Question 6

Is there a significant difference within group comparison for the experimental group in the cognitive processes category in a sample of urban high school students' expressive writing samples?

Hypotheses

H1: There will not be a significant difference in the cognitive processes category of expressive writing samples from Day 1 to Day 3 for the experimental group.

Analysis: Paired Samples t-test

H2: There will not be a significant difference in the cognitive processes category of expressive writing samples from Day 1 to Day 3 for the control group.

Analysis: Paired Samples t-test

H3: There will not be a significant difference in cognitive processes category in expressive writing samples between the experimental and control groups.

Analysis: Independent-Samples t-test

Research Question 7

Is there a significant difference within group comparison for the experimental group in the psychological processes category in a sample of urban high school students' expressive writing samples?

Hypotheses

H1: There will not be a significant difference in the psychological processes category of expressive writing samples from Day 1 to Day 3 for the experimental group?

Analysis: Paired Samples t-test

H2: There will not be a significant difference in the psychological processes category of expressive writing samples from Day 1 to Day 3 for the control group.

Analysis: Paired Samples t-test

H3: There will not be a significant difference in psychological processes category in expressive writing samples between the experimental and control groups.

Analysis: Independent-Samples t-test

Analysis of Covariance

The ANCOVA allowed the researcher to explore differences between groups while statistically controlling for covariate, in this study the pretest. ANCOVA using the covariate to control for pre-existing differences between the groups. Studies that have small sample sizes, or small or medium effect sizes benefit from this type of analyses. It is also effective when examining differences between intact groups. The assumptions of the ANCOVA include measurement of the covariate prior to intervention, reliability of the covariate, normality, homogeneity of variance, linearity, homogeneity of regression, and reliability of covariate.

Multiple Regression

A multiple regression analyses can be used in several ways: to determine how well a set of variables is able to predict a particular outcome; to determine which variable in a set of variables is the best predictor of an outcome; and to determine whether a predictor variable is still able to predict an outcome when the effects of another variable are controlled for. In this research, standard multiple regression was used to determine how much each predicted variable contributed to the variance of the outcome variable.

Assumptions of the multiple regression included normality, linearity, multi collinearity, homoscedasticity, and independence of residuals.

Independent Samples t-Test

An independent sample t-test was used to compare mean scores of two different groups or conditions. Statistically it tests the probability that the two sets of scores came from the same population. The assumption of the t-test included independent of observations, normality and homogeneity of variance.

DATA ANALYSES

Data was analyzed using descriptive statistics. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative Analysis included content analysis of writing samples obtained from the experimental and control groups. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC 2001). Demographic information regarding student's gender, ethnicity, grade level and age was obtained from the division's student data base. Practice mathematics Virginia Standard of Learning Scores was acquired through the geometry teacher's class reports.

To examine question one a paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on stress, as assessed by the PILL, for the experimental group and for the control group. A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of stress, as measured by the PILL. A one-way analysis of covariance (ANCOVA) was

conducted to compare the effect of expressive writing on stress, as assessed by the PILL, between the experimental group and the control group, on the posttest, using the pretest PILL scores as a covariate.

To examine question two a series of paired samples t tests were conducted to determine if there were differences between the pre test and post test scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, for the experimental group and for the control group. A series of one-way analysis of variances (ANOVAs) were conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of general anxiety, as measured by the MAACL-R subscales (Depression, Anxiety, and Hostility) and composite scores (Positive Affect, Sensation Seeking, Dysphoria, and PASS). A series of analysis of covariances (ANCOVAs) were conducted to determine the difference between the experimental and control groups post test scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, using their respective pre test scores as covariates.

To examine question three a paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on anxiety, as assessed by the MARS, for the experimental group and for the control group. A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of anxiety, as measured by the MARS. A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on anxiety, as assessed by the

MARS, between the experimental group and the control group, on the posttest, using the pretest MARS scores as a covariate.

To examine question four a paired samples t-test was conducted to determine if there was a significant difference between the pre test and posttest scores on the Mathematics' Practice Standard of Learning Test for the experimental group and for the control group. A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on mathematics test scores, as measured by the Mathematics' Practice Standard of Learning Test. A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on mathematics scores, as assessed by the Mathematics' Practice Standard of Learning Test, between the experimental group and the control group, on the posttest, using the pretest Mathematics' Practice Standard of Learning Test scores as a covariate.

To examine question five standard multiple regression was used to assess the contribution of the predictor variables (e.g., group membership, posttest scores on the PILL, MAACL-R, and the MARS-A, and the pre-test scores of the VA Math Practice SOL) on the outcome variable, the posttest scores on the VA Math Practice SOL.

An additional analysis, a one-way between groups MANCOVA, was conducted to investigate the differences between the experimental and control groups on the posttest scores for the VA Math Practice SOL, PILL, MARS-A, and the MAACL-R. Preliminary assumptions' testing was performed to check for normality, linearity, outliers, homogeneity of variance, and multicollinearity; no serious violations were noted.

To examine question six a series of paired samples t tests were conducted to determine if there were significant differences between the experimental group's essay samples Day 1 to Day 3 cognitive processes scores, as assessed by the subcategories, Cognitive Processes, Insight, Causation, Discrepancy, Tentative, Certainty, Inhibition, Inclusive and Exclusive. A series of paired samples t tests were conducted to determine if there were significant differences between the control group's essay samples Day 1 to Day 3 cognitive processes scores, as assessed by the subcategories, Cognitive Processes, Insight, Causation, Discrepancy, Tentative, Certainty, Inhibition, Inclusive and Exclusive. A series of independent samples t tests were conducted to determine if there were significant differences between the experimental and control group essay samples on Day 1 and Day 3 cognitive processes scores, as assessed by the subcategories, Cognitive Processes, Insight, Causation, Discrepancy, Tentative, Certainty, Inhibition, Inclusive and Exclusive.

To examine question seven a series of paired samples t tests were conducted to determine if there were significant differences between the experimental group's essay samples Day 1 to Day 3 psychological processes, as assessed by the subcategories, Social Processes, Family, Friends, Humans, Affective Processes, Positive emotion, Negative emotion, Anxiety, Anger, and Sadness. A series of paired samples t tests were conducted to determine if there were significant differences between the control group's essay samples Day 1 to Day 3 psychological processes, as assessed by the subcategories, Social Processes, Family, Friends, Humans, Affective Processes, Positive emotion, Negative emotion, Anxiety, Anger, and Sadness. A series of independent samples t tests were conducted to determine if there were significant differences between the experimental

and control group essay samples on Day 1 and Day 3 psychological processes, as assessed by the subcategories, Social Processes, Family, Friends, Humans, Affective Processes, Positive emotion, Negative emotion, Anxiety, Anger, and Sadness.

Participants

The final sample consisted of ninety-three participants, fifty-one females and forty-two males. Participants ranged in age from 14 to 19 ($M = 16.56$, $SD = 1.03$). Only one participant was classified as a ninth grader, while grade levels 10, 11, and 12 had better representation in the study, 20 (21.3%), 46 (48.9%), and 27 (28.7%) participants, respectively. The participants' grade point average ranged from 1.11 (D) to 2.93 (B-) ($M = 1.92$, $SD = .41$). Reported ethnicities were as follows: 71 (75.5%) were African-American/Non-Hispanic, 17 (18.1%) were Caucasian/Non-Hispanic, 3 (3.2%) were Hispanic, 1 (1.1%) were Asian, 2 (2.1%) were Multiracial.

The participants in this study did not receive the .50 geometry credit. Each course has a value of .50 and in order to meet math requirements, students must receive 1.0 for each math course, which is taken over two semesters. If students are successful in completing the course the second time around, they may take the second part of the course during summer school to receive the additional .50 credit, or during the following academic school year. The research allowed them to take the second part of the course to complete the full semester requirement.

The Virginia Mathematics SOL test is required for graduation and serves as one of the verified credits needed when reviewing academic and SOL requirements. To receive a *Standard Diploma*, students will have to earn one standard unit of credit in math. In order to receive the *Advanced Studies Diploma*, students will have to earn two

standard units of credit in math. Participants in this geometry class have passed the first semester successfully and need to pass the second semester portion of the class along with the standard of learning test to meet diploma requirements. This strategy was put in place by this urban high school to support those students who did not take the second semester course of geometry during summer school. This strategy eliminated students from having to sit out a semester of math until it is offered during the second semester, the following year.

Protection of Anonymity

Data and confidential records were stored in a secured area in a locked file cabinet. Writing samples and instrument answers were not shared with participant's teacher. During pretest and posttest, information was gathered based on a coding system. The writing intervention was coded with numbers that did not identify students.

INSTRUMENTS

The Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1980) measured the frequency general physical symptoms and sensations associated with stress. For the purpose of this study the PILL was modified and scores achieved with the modified PILL are not comparable with the norm sample. The original PILL instrument is a 54 item instrument with a five point scale designed to evaluate the frequency of general physical symptoms. One of the major advantages of The PILL is that it allows the researcher to see which specific symptoms are commonly experienced by the participants. The PILL can be used in ways other than assessing one's general proclivity for reporting physical symptoms. The PILL was modified, for this research, using Pennebaker's Symptom/Emotion Checklist: A State Measure to select symptoms which

were common to both the checklist and the inventory and related to an adolescent population. The modified symptom inventory consisted of 20 items. High scores reflect the higher amounts of physical symptoms associated with stress and anxiety. The range for the PILL was 0-20. The modified PILL listed twenty symptom types where participants marked the following categories: *Have never or almost never experienced, every week or so, and more than once a week*. Some examples of symptoms included: increased heart rate, faster breathing, dryness in mouth, and upset stomach. If the participants indicated every week or so or more than once a week, the researcher gave them a score of one. If the participants indicated never or almost never experienced the researcher gave them a score of zero. This was the alternative scoring approach noted in the PILL manual. The original scoring approach which involved summing the items using a scale correlates .96 with the alternative scoring approach used in this study. The internal consistency of the PILL is high. When scored using the alternative method the Cronbach alpha is .88 as compared to the original score method which is .91. The test re-test reliability of the alternative scoring method and the original scoring method over a two month period (for 177 subjects) was .79 and .83 respectively.

The Math Anxiety Rating Scale (MARS), a 98-item inventory developed for secondary school students and adults, was developed by Suinn to provide a unidimensional measure of anxiety related to the number operations and other mathematical concepts (Suinn, Edie, Nicoletti, & Spinelli, 1972). Some examples of situational items on the MARS were: adding up $976 + 777$ on paper, counting a pile of change, studying for a math test, and doing a word problem in algebra. Participants indicate the degree of anxiety produced in response to situational items by indicating

“not at all”, *“a little”*, *“a fair amount”*, *“much”*, or *“very much”* each category separated in columns. The researcher, followed the scoring guidelines outlined in the manual, and assigned values of one point to *“not at all”*, two points to *“a little”*, three points to *“a fair amount”*, four points to *“much”*, and five points to *“very much”*. The researcher counted the number of checks in each column and multiplied each total by the corresponding value for that column. This procedure was repeated for each page of the survey. The researcher added the score from each page to produce the total score for the individual survey. The possible minimum score if a participant indicated *“not at all”* on each item would be 98 and the possible maximum score if a participant indicated *“very much”* on each item would be 490. Thus the range for the MARS is 98-490. Overall, high scores reflect high anxiety associated with mathematics. The MARS is highly reliable, having a reliability coefficient of .90. It also has high internal consistency, having a coefficient alpha of .96. Normative information for secondary high schools was obtained with 197.6 being the mean MARS-A score (Suinn & Edwards, 1982).

Practice Standard of Learning Mathematics' Test was a released sample set of Standards of Learning (SOL) administered to Virginia public school students during the previous spring test administration and released by the Virginia Department of Education. The released tests are not inclusive of all SOL tests administered during the previous year; however, the tests are representative of the content and skills assessed.

The Multiple Affect Adjective Checklist-Revised (MAACL-R), developed by Lubin and Zuckerman (1999) measures affective states and traits. The checklist is a form with 132 adjectives to measure Anxiety, Depression, Hostility, Positive Affect and Attention Seeking, which are subscales of the MAACL-R. The scale has a Dysphoria

composite score obtained by adding the raw scores of the Anxiety, Depression, and Hostility sub scales. The MAACL-R scale has a Positive Affect and Sensation Seeking (PASS) composite score obtained by adding the raw scores of the Positive Affect and Sensation Seeking subscales. The checklist may be used to quantify the subject's mood with respect to depression and anxiety. Designed for use with college students as a measure of test anxiety, the instrument has also been used with high school populations. The directions noted, “ *On the back of the sheet you will find words which describe different times of mood and feeling. Blacken in the circle beside the word which describes how you feel right now, today. Some of the words may sound alike, but we want you to check all the words that describe your feelings. Work rapidly.* ” Some examples of the adjectives included: active, afraid, fearful, merry, shy, powerful and wild. Raw scores for each subscale and each composite score were converted into t-scores, using the corresponding table in the Appendix of the MAACL-R manual.

Qualitative Analysis included content analysis of writing samples obtained from the experimental and control groups. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC-2001). The LIWC-2001 Program has two central features which is the processing component and the dictionaries. The processing feature is the program itself, which opens a series of text files – which can be essays, poems, blogs, and novels. The program then goes through each file word by word. Each word in a given text file is compared with the dictionary file.

PROCEDURE

The researcher received approval from the Old Dominion University's Human Subjects Institutional Review Board, the Urban School Division, the school principal and teacher(s) of the course. Written informed consents were requested and obtained from parents and guardians of students under the age of consent. A letter outlining the purpose and goals of the study and the right to refuse participation in the study without consequences was mailed to each parent's or guardian's home address. The parental informed consent letter included the study title, identity of the researchers, introduction of the study, identified possible risks as well as potential benefits, and an explanation of the confidentiality measures. Written consent was obtained from students over the age of consent prior to participation and assent was obtained from students whose parents or guardians gave consent to participate. The study was described to the participants in the classroom setting. The researcher explained the steps to be taken to maintain confidentiality, reaffirming that the parents, guardians, teacher(s) and administrators would not have access to the writing samples or individual assessments. Participants were also reminded of the option of not participating without grade penalty. To alleviate potential concerns that the interventions might detract from the teacher's implementation of the mathematics curriculum, a meeting with the mathematics teachers was held to provide information about the proposed study. The study was supervised by Dr. Nina Brown and Dr. Steve Myran, faculty members at Old Dominion University.

The PILL, MAACL-R, and MARS-A were administered in the classrooms of the intact class groups followed by a writing sample for the experimental group and control group. The researcher and one administrator administered the instruments to the

participants before the short term expressive writing intervention was administered.

These measures served as a baseline measure of current anxiety, stress and mathematics anxiety. The Practice SOL Math Test was given to both groups prior to the pretest assessment and again a week later after the expressive writing intervention. Absent students did not have an opportunity to re-test in accordance to the teacher's guidelines. The following was read to each class regarding each instrument.

Good Morning/Afternoon

Thank you for returning your permission forms and today I will administer three instruments. All data is confidential and codes are used in place of your names. Please work independently and do not linger on responses. Your first instinct will be fine. This is not a test. The first instrument is the PILL. Your instruments are numbered and I should receive a copy back from all participants.

I. *The PILL – Common symptoms which most people have experienced them at one time or another are listed. We are currently interested in finding out how common each symptom is among high school students. If these symptoms occur at anytime, please respond next to the number corresponding to the symptoms by darkening the circle which indicates how frequently you experience that symptom.*

II. *MAACL –R: Multiple Affect Adjective Check List-Revised – Responses should be based on how you feel today. You would not shade every category, only what applies to you right now.*

III. *MARS – Math Anxiety Rating Scale – This instrument rates your anxiety level as it applies to math. For each item, please check in the circle under the column that describes how much you would be made anxious by it. Work quickly, but be sure to think*

about each item. Keep in mind that your responses are based on mathematics and not any other courses.

Please feel free ask questions if you are uncertain about any of the information I am going over with you. Thank you in advance for agreeing to participate in this research.

Written Expression Intervention

Research has shown the way that individuals talk and write provide windows into their emotional and cognitive worlds. Studies done by Gottschalk, Glaser, 1969, Rosenberg, Tucker, 1978, and Stiles, 1992 suggest that people's physical and mental health can be predicted by the words they use. A large number of studies have found that having individuals write or talk about deeply emotional experiences is associated with improvements in mental and physical health (e.g., Pennebaker, 1997, Smyth, 1997).

Text analyzed in these studies indicated that those individuals who benefit the most from writing tend to use relatively high rates of positive emotion words, a moderate number of negative emotion words and most importantly an increase number of cognitive or thinking words from the first to the last days of writing (e.g. Pennebaker, Francis, 1996, Pennebaker, Mayne, Francis, 1997). The Linguistic Inquiry and Word Count (LIWC-2001) was used for the content analysis of these writing tasks. LIWC analysis has demonstrated good internal consistency across different writing samples and topics and external validity is demonstrated by high correlations between independent judges' ratings of written text and the LIWC-2001 output. People's word usage patterns measured by LIWC-2001 satisfy the basic psychometric requirements of stability over time and consistency across context (Balke, Wilhelm, Johnson, Boskovic et.al. 2006).

The written expression intervention was explained to the experimental and control group. The researcher and technology personnel secured a computer lab to use over a period of three days. Instructions were read and placed in a file saved to the computer noting to participants that spelling, sentence structure, and grammar were not important for the sample. All responses were saved on a thumb drive by the researcher. Students were given a sheet, with information read by the researcher, regarding the question for the day and were asked to write for 15 minutes over a period of three days about three topics.

Writing Prompts for Experimental Group:

The experimental groups of students were given the following directions:

Day 1: *Good Morning/Good Afternoon. Today you will participate in a writing intervention over a period of three days. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. I would like you to discuss how you feel about mathematics. Please do not save the information to the computer. Are there any questions before you start?*

Day 2: *Good Morning/Afternoon. We will continue day two of your writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar,*

or sentence structure. You may continue your thoughts from the topic from yesterday on "How you feel about mathematics", or you can write about the topic for today which is- How do you feel about SOL Testing? Please do not save the information to the computer. Are there any questions before you start?

Day 3: *Good Morning/Afternoon. We will continue day three, your final writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes, and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may write about your topic from yesterday regarding how you feel about SOL Testing? or you can write about the new topic for today, which is -How do you feel about school? Please do not save the information to the computer. Are there any questions before you start?*

Writing Prompts for Control Group:

The control groups of students were given the following directions:

Day 1: *Good Morning/Good Afternoon. Today you will participate in a writing intervention over a period of three days. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. I would like you to write about your plans after high school. Please do not save the information to the computer. Are there any questions before you start?*

Day 2: *Good Morning/Afternoon. We will continue day two of your writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may continue your thoughts from the topic from yesterday on “your plans after graduation”, or you can write about the topic for today, which is- Qualities of a good teacher. Please do not save the information to the computer. Are there any questions before you start?*

Day 3: *Good Morning/Afternoon. We will continue day three, your final writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes, and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may write about your topic from yesterday regarding qualities of a good teacher, or you can write about the new topic for today, which is –Your favorite time of the year? Please do not save the information to the computer. Are there any questions before you start?*

Data Collection Schedule

After all research review bodies approved the proposed study, the following procedure was implemented.

1. The researcher spoke with teachers and followed up with the school principal about the research. Letters were mailed to parents and guardians regarding the research along with consent and permission forms.
2. Researcher spoke with the classes about the purpose of the study after gaining permission from teacher(s) and principal. The researcher collected forms from teachers and one parent called for additional information regarding the research. Additional time was needed to collect permission forms and researcher followed up with telephone calls to parents and re-issued consent forms to be signed by parents or guardians.
3. The practice SOL mathematics test was administered by the teachers.
4. Pretest assessments (The PILL, MARS, MACCL-R) was given and collected from both experimental and control groups.
5. A week later, writing intervention was administered to the experimental and control group over a period of three days for fifteen minutes each day.
6. One week after the writing intervention, a post -SOL Practice Mathematics test was given to both experimental and control groups.
7. Post –test assessments (The PILL, MARS, MACCL-R) will be given and collected from both groups.
8. The experimental and control group writing samples were analyzed using the Linguistic Inquiry Word Count (LIWC 2001). A coded student number was used to identify students. Data and confidential records were stored in a secured area in a locked file cabinet. Writing samples and instrument answers were not shared with participant's teacher. During pretest and posttest, information was gathered based on a coding system. The writing intervention was coded with numbers that did not identify to students.

9. Pizza social was held for all participants and teachers during three lunch periods.
10. After analyzing the data the researcher followed up with the study participants, parents/guardians and accountability office with the division to share the results of the assessments.

Sample Size, Power, and Significance

To detect a medium difference at power .80 between two groups for, ANCOVA, ANOVA, t –Tests, and MANOVA, Cohen suggests a N of 64; for a large difference at the same power level, a N of 26 is suggested. To detect a medium difference at power .80 for a multiple regression, 84 and 91 participants are suggested for four and five independent variables, respectively.

Group	Comparisons	
<u>Within Group Comparisons</u>		
Experimental Group	Pre-test Practice SOL	Post-test Practice SOL
	Pretest MARS-A	Posttest MARS-A
	Pretest MAACL-R	Posttest MAACL-R
	Pretest PILL	Posttest PILL
Control Group	Pretest Practice SOL	Posttest Practice SOL
	Pretest MARS-A	Posttest MARS-A
	Pretest MAACL-R	Posttest MAACL-R
	Pretest PILL	Posttest PILL
<u>Between Group Comparisons</u>		
Post-test Practice SOL	Expressive Writing Group	Control & Experiment Group
Post-test MARS-A	Expressive Writing Group	Control & Experiment Group
Posttest MAACL-R	Expressive Writing Group	Control & Experiment Group
Post-test PILL	Expressive Writing Group	Control & Experiment Group
Post-Practice SOL Test	Expressive Writing Group	Control & Experiment Group

CHAPTER IV

RESULTS

Chapter one of this study introduced background studies, introduction of key constructs and concepts, importance of the study, purpose of the study, research questions, assumptions of the study and definition of terms. Chapter two provided review and an introduction of the literature, for expressive writing and anxiety, stress, mathematics anxiety, cognitive processes, and psychological processes. Chapter three discussed the methodology of this study, introduction to the chapter, research questions and hypotheses, participants, instrumentation, methods, and plan for analyzing the data. Chapter IV presents the results from this study.

The results are presented in seven sections. The purpose of this study was to examine the effects of expressive writing on anxiety, stress, mathematics anxiety, cognitive processes, and psychological processes on the Virginia Standards of Learning (SOL) on a Sample of Urban High School Students Failing Mathematics. A description of the procedures used to gather data are described and results presented for demographics, pretest and posttest analyses and results and outcomes of additional analyses.

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress, mathematics anxiety, and cognitive and psychological processes using a short term intervention. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research was explored on cognitive processes, and psychological processes, analyzing writing samples, to see if

changes occurred as a result of either emotional or neutral writing over three days. An additional issue that was explored was to see if there was an effect on the Virginia Standard of Learning (SOL) practice scores for students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school. There have been several studies demonstrating the benefits of expressive writing on health outcomes; however, none were found that explored the effects of expressive writing with adolescents in an academic environment. The expressive writing samples were analyzed using the Linguistic Inquiry Word Count (LIWC-2001) software to gather information about their cognitive and psychological processes.

Research Questions

1. What is the effect of expressive writing on stress in a sample of urban high school students?
2. What is the effect of expressive writing on general anxiety in a sample of urban high school students?
3. What is the effect of expressive writing on mathematics anxiety in a sample of urban high school students?
4. What is the effect of expressive writing on mathematics test scores in a sample of urban high school students?
5. What is the relationship between the predictor variables, group membership (experimental and control), stress general anxiety, math anxiety, and previous mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students?

6. Is there a significant difference between the experimental group and the control group on the cognitive processes category in a sample of urban high school students' expressive writing samples?
7. Is there a significant difference between the experimental group and the control group on the psychological processes category in a sample of urban high school students' expressive writing samples?

Procedure

The researcher received approval from the Old Dominion University's Human Subjects Institutional Review Board, the Newport News Public School System, the school principal and teacher(s) of the course. Written informed consent was requested and obtained from parents and guardians. A description of the study, anticipated risks and benefits, procedures to maintain confidentiality, withdrawal privileges, and a permission form were directly to parents and guardians through the mail. The purpose of the study and its relevance to students was explained. The cooperation and participation of school administrative officials and mathematics teachers was granted. To alleviate potential concerns that the interventions might detract from the teacher's implementation of the mathematics curriculum a meeting with the mathematics teachers was held to provide information about the proposed study.

The researcher, an Old Dominion University doctoral student, collected the data, formulated a research design and conducted the research with the assistance of the mathematics teachers, school counselors, one administrator, and one technical support person. The teachers of the course administered and scored the Practice SOL Test during the pretest and posttest. The school counselors checked to make sure all students who

qualified to take the mathematics' course was enrolled in the class. The classroom teachers were present while the researcher conducted the study. One administrator and one technical support person was trained, by the researcher, to assist in administering the three instruments. The technical support person assisted in setting up a system which allowed all writing samples to be saved on one coded file. The study was supervised by Dr. Nina Brown and Dr. Steve Myran, faculty members at Old Dominion University.

The students were informed that their responses to measures and writings would not be accessible to their classmates, parents, guardians, or teachers. The PILL, MAACL-R, and MARS-A were administered in the classrooms of the intact class groups followed by a writing sample for the experimental group and control group. The researcher and one administrator administered the instruments to the participants before the value-laden and neutral topic to control group short term expressive writing intervention was given. These measures served as a baseline measure of current anxiety, stress and mathematics anxiety.

Participants

Intact classes were chosen because it is less disruptive to the learning process. The classes were selected based on previous academic performance in mathematics. Students in this research failed the first semester of geometry and repeated the course during the second semester. The research allowed them to take the second part of the course to complete the full semester requirement. The participants were (n=93) male and females in grades 9-12, ranging in ages from 14 to 19 years of age, from various socio-economic backgrounds. Students remained in intact class groups which were designated as either an experimental group or a control group. Both groups participated in the writing intervention.

Instruments

Data gathering instruments were the Pennebaker Inventory of Limbic Languidness (PILL), the Math Anxiety Rating scale, the Multiple Affect Adjective Checklist-Revised (MAACL), and the writing essays using the Linguistic Inquiry Word Count software (LIWC-2001).

The Pennebaker Inventory of Limbic Languidness (PILL) Pennebaker (1980) measured the frequency of general physical symptoms and sensations associated with stress are experienced. The PILL is a 54 item instrument with a five point scale designed to evaluate the frequency of general physical symptoms. The PILL, used in this study, was modified by using Pennebaker's Symptom/Emotion Checklist: A State Measure to select symptoms which were common to both the checklist and the inventory and related to an adolescent population. The modified symptom inventory consisted of 20 items. High scores reflect the higher amounts of physical symptoms associated with stress and anxiety.

The Math Anxiety Rating Scale (MARS) was developed by Suinn to provide a unidimensional measure of anxiety related to number operations and other mathematical concepts (Suinn, Edie, Nicoletti, & Spinelli, 1972). Subjects indicated the degree of anxiety produced in response to situational items by indicating a range from one to five. Total scores reflect the sum of item values. High scores reflect high anxiety associated with mathematics. Normative information for secondary high schools was obtained (Suinn & Edwards, 1982) with 197.6 being the mean MARS-A score.

The Multiple Affect Adjective Checklist-Revised (MAACL-R), developed by Lubin and Zuckerman (1999) measured affective states and traits. The instrument

incorporated three basic scales: Anxiety, Depression, and Hostility. The checklist was a form with 132 adjectives measuring the major scales and the sub-scales of Positive Affect and Attention Seeking. Designed for use with college students as a measure of test anxiety, the instrument has also been used with high school populations. Raw scores for each subscale and each composite score were converted into t-score, using the corresponding table in the Appendix of the MAACL-R manual. The t- scores for each subscale and each composite score were added producing the total score for the MAACL-R.

Qualitative Analysis included content analysis of writing samples obtained from the experimental and control groups. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC 2001), available for computer scoring. The LIWC-2001 Dictionary was composed of 2,290 words and word stems. Each word or word-stem defined one or more word categories or sub dictionaries. For example, the word 'cried' is part of four word categories: sadness, negative emotion, overall affect, and a past tense verb. Hence, if it is found in the target text, each of these four sub dictionary scale scores will be incremented. As in this example, many of the LIWC-2001 categories are arranged hierarchically. All anger words, by definition, will be categorized as negative emotion and as overall emotion words. Each of the 74 preset LIWC-2001 categories is composed of a list of dictionary words that define that scale (Pennebaker, Francis, Booth, 2001).

Data Gathering Procedures

The researcher received approval from the Old Dominion University's Human Subjects Institutional Review Board, the Newport News Public School System, the

school principal and teacher(s) of the course. Written informed consents were requested and obtained from parents and guardians of students under the age of consent. A letter outlining the purpose and goals of the study and of their right to refuse participation in the study without consequences, along with a consent form, was mailed to each parent's or guardian's home address. The parental informed consent letter included the study title, identity of the researchers, introduction of the study, identified possible risks and potential benefits, explanation of the confidentiality measures and the privilege to withdraw, and an agreement to participate in the study. Written consent was obtained from students over the age of consent prior to participation and assent forms were obtained from students whose parents or guardians gave consent to participate. The study was described to the participants in the classroom setting. The researcher explained the steps to be taken to maintain confidentiality, reaffirming that the parents, guardians, teacher(s) and administrators would not have access to the writing samples or individual assessments. A reminder was explained to the participants that they could withdraw at anytime without affecting their grade in the class. To alleviate potential concerns that the interventions might detract from the teacher's implementation of the mathematics curriculum, a meeting with the mathematics teachers was held to provide information about the proposed study. The study was supervised by Dr. Nina Brown and Dr. Steve Myran, faculty members at Old Dominion University.

The PILL, MAACL-R, and MARS-A were administered in the classrooms of the intact class groups followed by a writing sample for the experimental group and control group. The experimental and control group participated in an expressive writing intervention in the computer lab over a period of three days for 15 minutes. The

researcher read instructions and participants were asked to respond to one writing prompt each day. Information from expressive writing was saved on the researcher's thumb drive and the essays were analyzed using the Linguistic Inquiry Word Count (LIWC-2001). The Linguistic Inquiry and Word Count (LIWC-2001) was used for the content analysis of these writing tasks. The LIWC-2001 analysis has demonstrated good internal consistency across different writing samples and topics and external validity was demonstrated by high correlations between independent judges' rating of written text and the LIWC-2001 output. People's word usage patterns measured by LIWC-2001 satisfy the basic psychometric requirements of stability over time and consistency across context (Balke, Wilhelm, Johnson, Bosovic et.al. 2006). The Practice SOL Math Test was given to both groups prior to the pre-test assessment and again one week later after the expressive writing intervention by both teachers. Absent students did not have an opportunity to re-test in accordance to the teacher's guidelines for the practice test.

Protection of Anonymity

A coded student number was used to identify students. Data and confidential records were stored in a secured area in a locked file cabinet. Writing samples and instrument answers were not shared with participant's teacher. During pretest and posttest, information was gathered based on a coding system. The writing intervention was coded with numbers that did not identify students.

Written Expression Intervention

The written expression intervention was explained to the experimental and control group. Instructions were read and placed in a file saved to the computer noting to participants that spelling, sentence structure, and grammar was not important for the

sample. All responses were saved on a thumb drive by the researcher. Students were given a sheet, with information read by the researcher, regarding the question for the day and were asked to write for 15 minutes over a period of three days about three topics. The experimental group was asked to write about the following (Day 1) How do you feel about mathematics ? (Day 2) How do you feel about SOL Testing? (Day 3) How do you feel about school? The control group was given a sheet with information read by the researcher, with the question for the day and was asked to write for 15 minutes over a period of three days about three topics. (Day 1) What are your plans after high school? (Day 2) What are your plans after graduation? (Day 3) What is your favorite time of the year? The essays remained confidential, coded by the researcher and saved on the thumb drive after each writing exercise.

Writing Prompts:

The experimental group of students was given the following directions:

Day 1: *Good Morning/Good Afternoon. Today you will participate in writing intervention over a period of three days. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. I would like you to discuss how you feel about mathematics. Please do not save the information to the computer. Are there any questions before you start?*

Day 2: *Good Morning/Afternoon. We will continue day two of your writing intervention. You will be asked to type about one topic today. The writing exercise will take 15*

minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may continue your thoughts from the topic from yesterday on “How you feel about mathematics”, or you can write about the topic for today which is- How do you feel about SOL Testing? Please do not save the information to the computer. Are there any questions before you start?

Day 3: *Good Morning/Afternoon. We will continue day three, your final writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes, and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may write about your topic from yesterday regarding how you feel about SOL Testing? or you can write about the new topic for today, which is -How do you feel about school? Please do not save the information to the computer. Are there any questions before you start?*

The control group of students was given the following directions:

Day 1: *Good Morning/Good Afternoon. Today you will participate in a writing intervention over a period of three days. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. I would like you to write about your plans after*

high school. Please do not save the information to the computer. Are there any questions before you start?

Day 2: *Good Morning/Afternoon. We will continue day two of your writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may continue your thoughts from the topic from yesterday on “your plans after graduation”, or you can write about the topic for today, which is- Qualities of a good teacher. Please do not save the information to the computer. Are there any questions before you start?*

Day 3: *Good Morning/Afternoon. We will continue day three, your final writing intervention. You will be asked to type about one topic today. The writing exercise will take 15 minutes, and you will be asked to stop at the end of the 15 minutes. All of your writing will be completely confidential, and I will save your work on my thumb drive at the completion of your writing exercise. Please do not worry about spelling, grammar, or sentence structure. You may write about your topic from yesterday regarding qualities of a good teacher, or you can write about the new topic for today, which is –Your favorite time of the year? Please do not save the information to the computer. Are there any questions before you start?*

FINDINGS

Demographics

Demographic information such as each student's gender, ethnicity, grade level, and age, was obtained from the ESIS data based used by the division. The final sample consisted of ninety-three participants, males ($n=32$) and females ($n=61$). Participants ranged in age from 14 to 19 ($M=16.56$, $SD=1.03$). Only one participant was classified as a ninth grader, while the other students were in grades 10 ($n=20$, 21.3%), 11 ($n=46$, 48.9%), and 12 ($n=27$, 28.7%). The participants' grade point average on a four point scale ranged from a letter grade of "D" (1.1) to a letter grade of "B-" (2.93). The mean grade was 1.92 with a standard deviation of .41. Reported ethnicities were as follows: 71 (75.5%) were African-American/Non-Hispanic, 17 (18.1%) were Caucasian/Non-Hispanic, 3 (3.2%) were Hispanic, 1 (1.1%) were Asian, 2 (2.1%) were Multi-racial. The experimental group consisted of fifty-four participants, and the control group consisted of thirty-nine participants.

Table 3 presents the pre and posttest paired sampled t test results for the experimental group. Means decreased significantly for the MARS ($p < .04$), the Depression subscale ($p < .005$), the Anxiety subscale ($p < .000$), the Hostility subscale ($p < .000$), the Dysphoria subscale ($p < .000$). The Dysphoria subscale includes all three sub-scales, depression, anxiety and hostility, which indicated an overall decrease after the expressive writing intervention. The experimental group showed significantly less anxiety, depression, hostility and dysphoria after the expressive writing intervention.

Table 3

Pretest and Posttest Results for Experimental Group (n=55)

Test	N	<i>Pre-Test</i>		<i>Post-Test</i>		t	df	Sig.
		Mean	S.D.	Mean	S.D.			
Practice SOL	46	50.3	18.7	45.8	13.3	.85	45	.40
MARS	55	232.7	74.5	218.8	77.7	2.03	54	.05
Depression	55	52.3	10.1	46.7	8.5	2.91	54	.00
Anxiety	55	52.3	10.3	45.5	8.9	3.73	54	.00
Hostility	55	52.8	8.9	47.3	8.7	3.94	54	.00
Positive Affect	55	42.8	10.9	46.5	11.9	-1.88	54	.06
Sensation Seeking	55	59.2	14.1	56.6	18.9	.79	54	.44
Dysphoria	55	53.4	8.7	46.3	8.5	4.57	54	.00
PASS	55	49.8	10.8	53.4	12.4	-1.80	54	.08
PILL	55	8.3	4.4	8.9	4.9	.97	54	.33

Table 4 presents the pre and posttest paired sampled t – test results for the control group. Means decreased significantly for the Hostility subscale ($p < .04$) indicating a reduction in feelings in hostility from the pretest to the posttest after the neutral writing intervention.

Table 4

Pretest and Posttest Results for Control Group (n=38)

Test	N	<i>Pre-Test</i>		<i>Post-Test</i>		t	df	Sig.
		Mean	S.D.	Mean	S.D			
Practice SOL	27	55.1	17.4	47.4	15.1	.85	45	.40
MARS	38	209.3	71.9	196.8	71.6	1.4	37	.16
Depression	38	48.2	7.2	46.6	8.8	1.0	37	.32
Anxiety	38	47.4	7.5	49.8	12.2	-1.2	37	.24
Hostility	38	50.0	7.9	47.6	9.0	1.5	37	.04
Positive Affect	38	44.1	11.3	46.0	10.6	-.93	37	.36
Sensation Seeking	38	57.6	16.0	54.3	21.7	.98	37	.33
Dysphoria	38	48.3	7.1	47.3	9.1	.65	37	.52
PASS	38	51.7	14.0	54.6	12.4	-1.22	37	.23
PILL	38	7.1	4.4	6.9	4.8	.20	37	.84

Table 5 presents the ANOVA for pretest results for both groups, and between group comparisons on all measures. Significant differences between groups were found on the Depression subscale ($p<.03$), the Anxiety subscale ($p<.01$) and the Dysphoria subscale ($p<.00$). The experimental group scored higher on scales showing significant differences, and had more variability of scores. The experimental group showed significantly more anxiety, depression and dysphoria on the pretest than did the control group.

Table 5

Pretest Between Group Comparisons (n=93)

Test	<i>Experimental</i>		<i>Control</i>		<i>ANOVA</i>		
	Mean	S.D.	Mean	S.D.	F	p	Partial eta ²
Pre SOL Practice	50.3	18.7	55.1	17.4	1.4	.24	.02
Pre MARS	232.7	74.5	209.3	71.9	2.3	.13	.02
Depression	52.3	10.1	48.2	7.2	4.9	.03	.00
Anxiety	52.3	10.3	47.4	7.5	6.4	.01	.06
Hostility	52.8	8.7	50.0	7.9	2.4	.12	.02
Positive Affect	42.8	10.9	43.9	11.1	.22	.64	.00
Sensation Seeking	59.2	14.1	57.6	15.8	.27	.61	.00
Dysphoria	53.4	8.7	48.3	7.0	9.2	.00	.09
PASS	49.8	10.8	51.5	13.8	.44	.51	.00
Pre PILL	8.3	4.4	7.1	4.4	1.8	.17	.02

Table 6 presents the posttest results for both groups and between group comparisons. The Anxiety subscale on the MAACL-R was the only measure to show significant difference between groups ($p < .05$). The experimental group indicated a decrease in anxiety when comparing mean scores to the control group before the expressive writing intervention.

Table 6

Posttest Between Group Comparisons (n=93)

Test	<i>Experimental</i>		<i>Control</i>		<i>ANOVA</i>		
	Mean	S.D.	Mean	S.D.	F	p	Partial eta ²
Post SOL Practice	45.8	13.3	47.4	15.1	.24	.62	.00
Post MARS	218.8	77.7	196.8	71.6	1.9	1.7	.02
Depression	46.7	8.5	46.7	8.8	.00	.97	.00
Anxiety	45.6	8.9	49.8	12.2	3.8	.05	.04
Hostility	47.3	8.7	47.6	9.0	.02	.88	.00
Positive Affect	46.5	11.9	46.0	10.6	.10	.74	.00
Sensation Seeking	56.6	18.9	54.3	21.7	.22	.64	.00
Dysphoria	46.3	8.5	47.3	9.08	1.08	.30	.01
PASS	53.4	12.4	54.6	12.4	.05	.81	.00
Post PILL	8.9	4.9	6.9	4.8	3.5	.06	.04

Effects of Expressive Writing On All Measures

THE PILL

A one-way between groups ANCOVA was conducted to examine the effect of expressive writing on stress, as measured by the PILL, while controlling for the pretest scores which were used as a covariate. The Levene's test of Equality of Error Variances yielded a significance value of .941, meaning that the assumption of equality of variance was not violated. Results indicate that there was no significant difference between the experimental group (M= 8.85 SD=4.93) and the control group (M= 6.92 SD= 4.81) on post-test scores of the PILL, $F(1, 90) = 1.66$, $p < .201$, partial eta squared $< .02$.

MAACL-R

Ancillary analyses included a series of one-way between groups ANCOVAs to examine the effect of expressive writing on general anxiety, as measured by each of the subscales of MAACL-R, Anxiety, Depression, Hostility, Positive Affect, Dysphoria, Sensation-Seeking, and PASS, while controlling for the pretest scores. The pretest scores on each of the respective MAACL-R subscales were used as a covariate in this analysis. The Levene's test of Equality of Error Variances indicated that the assumption of equality of variance was violated only for the anxiety subscale. Results indicate that there was a statistical significant difference between the experimental group ($M = 45.6$ $SD = 8.9$) and the control group ($M = 49.8$ $SD = 12.2$) on post-test scores of the Anxiety subscale, $F(1, 90) = 5.11$, $p < .03$, partial eta squared $< .05$. There were no significant differences found between the experimental and control groups pre to post test on the subscales of the MAACL-R.

Table 7 presents the results of a one-way between groups ANCOVA to examine the effect of expressive writing on general anxiety, as measured by the MAACL-R, while controlling for the pretest scores by using them as the covariate. The Levene's test of Equality of Error Variances yielded a significance value of .22, meaning that the assumption of equality of variance was not violated.

Table 7

Between Group Comparisons on the MAACL-R Posttest Sub Scales (n=93)

Subscale	<i>Experimental</i>		<i>Control</i>		F	Sig.
	Mean	SD	Mean	SD		
Anxiety	45.6	8.9	49.8	12.2	5.11	.03
Depression	46.7	8.6	46.7	8.8	.01	.91
Hostility	47.3	8.7	47.6	9.0	.41	.52
Positive Affect	46.4	10.6	46.0	11.9	.10	.74
Sensation Seeking	56.6	18.9	54.3	21.7	.31	.58
Dysphoria	46.3	8.5	47.3	9.1	.29	.59
PASS	53.4	12.4	54.6	12.4	.19	.66

MARS-A

A one-way between groups ANCOVA was conducted to examine the effect of expressive writing on mathematics anxiety while controlling for the pretest scores by using them as the covariate. The Levene's test of Equality of Error Variances yielded a significance value of .73, meaning that the assumption of equality of variance was not violated. Results indicate that there was no significant difference between the experimental group (M= 218.8 SD= 77.71) and the control group (M= 196.84 SD= 71.6) on post-test scores of the MARS-A, $F(1, 90) = .21$, $p < .65$, partial eta squared $< .00$.

Practice SOL Test

A one-way between groups ANCOVA was conducted to examine the effect of expressive writing on scores on the practice SOL test using the pretest scores as covariates. The Levene's test of Equality of Error Variances yielded a significance value of .868, meaning that the assumption of equality of variance was not violated. Results

indicate that there was no significant difference between the experimental group ($n = 46$; $M = 46.46$ $SD = 13.34$) and the control group ($n = 27$; $M = 49.7$ $SD = 14.8$) on the November administration of the VA Math Practice SOL, $F(1, 70) = .165$, $p < .686$, partial eta squared $< .002$.

Multiple Regression Analyses

Standard multiple regression was used to assess the contribution of the predictor variables (e.g., group membership, posttest scores on the PILL, MAACL-R, and the MARS-A, and the pre-test scores of the VA Math Practice SOL) on the outcome variable, the posttest scores on the VA Math Practice SOL. The regression model was not statistically significant, $F(5, 67) = 1.82$, $p < .12$; the adjusted R square $< .054$. When evaluating the predictor variables individually, the pretest scores on the VA Math Practice SOL made a significant and unique contribution to explaining the outcome variable, November VA Math Practice SOL, when the variance explained by all the other predictor variables are controlled ($\beta = .28$, $p < .02$).

MANCOVA

An additional analysis, a one-way between groups MANCOVA, was conducted to investigate the differences between the experimental and control groups on the posttest scores for the VA Math Practice SOL, PILL, MARS-A, and the MAACL-R. Preliminary assumptions' testing was performed to check for normality, linearity, outliers, homogeneity of variance, and multicollinearity; no serious violations were noted. There were no statistically significant differences found between the experimental and control groups on the combined dependent variables, $F(4, 70) = .18$, $p < .95$; Wilks' Lambda = .99; partial eta squared $< .01$. The experimental group had higher means on the PILL

($M = 8.78$, $SD = 4.9$), MARS-A ($M = 223.20$, $SD = 79.1$), than the control group ($M = 6.67$, $SD = 4.1$), ($M = 194.82$, $SD = 72.5$).

Analysis of Essays

The first and third day essays were analyzed using the Linguistic Analysis and Word Count (LIWC-2001) which assessed words used in two categories: cognitive processes and psychological processes.

Pennebaker et al. (1997) found that health improvement was associated with word use patterns indicating that the participants were creating meaningful stories. They concluded that the more participants increased their use of words having to do with gaining insight (e.g., realize, understand, reconsider, see) and words associated with causal relationships (e.g., because, reason, cause, why, thus), the more their health improved.

Cognitive Processes on Essays

Table 8 presents the within group mean comparisons for the experimental group on expressive writing for the category of cognitive processes. Cognitive processes refer to how individuals compute, memorize, read, perceive and solve problems (Kitchener, S. 1983). Examples of words in the cognitive processes category are insight, tentative, exclusive, and inclusive. More words were used on Day 3 than on Day 1 essays on cognitive processes $t = -3.4$, $p < .05$ and the insight category $t = -3.4$, $p < .00$ within group comparisons for cognitive processes. Indicating, on day three, the experimental group organized and structured their thoughts while planning out what they wanted to write. They were able to describe their feelings by actively processing and reviewing their thoughts on the topic regarding how they felt about school.

Table 8

Within Group Analyses for Experimental Group on Cognitive Processes (n=40)

Construct	<i>Day 1</i>		<i>Day 3</i>		t	Sig.
	Mean	SD	Mean	SD		
Cognitive Proc.	18.7	4.1	20.7	5.0	-2.0	.05
Insight	3.4	2.1	4.9	2.4	-3.4	.00
Causation	2.3	1.3	2.2	1.5	.43	.66
Discrepancy	2.9	2.5	2.2	1.7	1.3	.21
Tentative	3.8	2.3	3.6	1.9	.49	.63
Certainty	1.4	1.2	1.8	1.3	-1.3	.21
Inhibition	.20	.37	.31	.52	-1.1	.27
Inclusive	3.8	2.5	3.4	1.8	.75	.45
Exclusive	3.8	1.6	4.4	2.4	-1.5	.13

Table 9 presents the within group mean comparisons for the control group on expressive writing for the category of cognitive processes. More words were used on Day 3 than on Day1 essays on cognitive process $t = -2.3$, $p < .02$ and insight category $t = -3.7$, $p < .00$. More words were used on Day 1 than Day 3 in the causation category $t = 2.5$, $p < .02$ within group comparisons for cognitive processes. Participants in the control group used words indicating they processed and structured their thoughts about what they were writing when expressing their feelings on their favorite time of the year. On Day 1, the control group used words indicating cause and effect analogy expressing their feelings about completing high school.

Table 9

Within Group Analyses for Control Group on Cognitive Processes (n=27)

Construct	<i>Day 1</i>		<i>Day 3</i>		t	Sig
	Mean	SD	Mean	SD		
Cognitive Proc.	16.0	3.6	18.7	6.0	-2.3	.02
Insight	1.5	1.2	3.2	2.3	-3.7	.00
Causation	2.6	1.9	1.6	1.1	2.5	.02
Discrepancy	2.3	2.2	2.7	1.8	-1.2	.26
Tentative	2.3	2.2	2.9	2.0	-1.4	.19
Certainty	1.8	1.2	1.5	1.5	-1.1	.28
Inhibition	.11	.38	.37	.67	-1.7	.11
Inclusive	5.3	3.3	4.9	3.3	.41	.68
Exclusive	2.1	2.1	2.7	1.8	-1.2	.23

Table 10 presents the between group comparisons on day one and day three writing for the category of cognitive processes. The experimental group used more words in their Day 1 essays than the control group, $t = -2.7$, $p < .01$; insight category $t = -4.7$, $p < .00$; tentative category $t = -2.8$, $p < .01$, and exclusive category $t = -3.6$, $p < .01$ (two-tailed). On day one the experimental group processed their thoughts on the topic using words of uncertainty (e.g. maybe, perhaps) and used words indicating they were being honest about their feelings evident by their exclusive word usage in comparison to the control group responses. The control group used more words than the experimental group in their essays dealing with the inclusive category $t = 2.0$, $p < .04$ (two-tailed). The control group used words that were more general in their responses

than the experimental group. For Day 3, the experimental group used more words in their essays dealing with insight category $t = 2.7, p < .01$; and the exclusive category $t = -3.0, p < .03$. The control group used more words in their essays dealing with the inclusive category $t = 2.4, p < .03$ (two-tailed). When processing their thoughts, the experimental group used words describing their honest feelings about the topic. The control group used more inclusive word usage (e.g. and, with) during the writing intervention.

Table 10

Between Group Analyses for Cognitive Processes (n=67)

Construct	Day 1			Day 3			t	SIG.	Control			t	SIG.
	Mean	SD	Experimental	Mean	SD	Experimental			Mean	SD	Control		
Cognitive	18.6	4.1		16.0	3.6		-2.7	.01	18.7	6.0		1.8	.14
Proc.													
Insight	3.4	2.0		1.5	1.2		-4.7	.00	3.2	2.3		2.7	.01
Causation	2.3	1.3		2.6	1.9		6.4	.53	1.6	1.1		-1.8	.08
Discrepancy	2.9	2.5		2.3	2.2		-1.0	.30	2.7	1.8		1.1	.25
Tentative	3.8	2.3		2.3	2.2		-2.8	.01	2.9	2.0		-1.3	.24
Certainty	1.4	1.1		1.1	1.2		-.92	.36	1.5	1.5		-.78	.44
Inhibition	.20	.37		.10	.37		-1.0	.31	.37	.67		.36	.77
Inclusive	3.8	2.5		5.2	3.3		2.0	.04	4.9	3.3		2.4	.02
Exclusive	3.8	1.6		2.1	2.0		-3.6	.01	2.7	1.8		-3.0	.03

Psychological Processes on Essays

Table 11 presents the within group mean comparisons for the experimental group on expressive writing for the category of psychological processes. Psychological Processes refers to human interaction. Almost all processes invariably involve other processes

When we are talking to a person we perceive him/her, use memory while referring to specific information, and may feel the positive emotion of love and affection, and become motivated to continue the association with him/ her. Examples of words in the psychological processes categories include negative emotions, anger, sadness and anxiety. More words were used on Day1 than Day 3 essays on social processes $t = 3.5$, $p < .00$, friends $t = 2.5$, $p < .01$ and humans' category $t = 4.0$, $p < .00$ within group comparisons for psychological processes. The experimental group used words associated with social interaction regarding friends and individuals they are close to during the expressive writing on feelings about mathematics.

Table 11

Within Groups Analyses for the Experimental Group on Psychological Processes (n=40)

Construct	<i>Day 1</i>		<i>Day 3</i>		t	Sig
	Mean	SD	Mean	SD		
Social Process	6.1	3.9	3.8	2.9	3.5	.00
Family	.09	.31	.02	.10	1.5	.14
Friends	.14	.32	.00	.06	2.5	.01
Humans	.66	.79	.12	.32	4.0	.00
Affective Process	5.6	2.3	5.8	2.5	-.42	.68
Positive Emotions	3.8	2.5	3.4	2.6	.87	.39
Negative Emotions	1.8	1.2	2.5	2.2	-1.9	.06
Anxiety	.41	.61	.54	1.0	-.67	.51
Anger	.48	.82	.39	.81	.65	.52
Sadness	.31	.55	.23	.40	.84	.40

Table 12 presents the within group mean comparisons for the control group on expressive writing for the category of psychological processes. More words on Day 1 than Day 3 essays on family category $t = 2.4, p < .02$. Participants shared feelings about their family regarding their plans after high school. The family unit appeared to be an important part of their plans. More words were used on Day 3 than Day 1 in social processes $t = -4.7, p < .00$, affective processes $t = -2.9, p < .00$, positive emotions $t = -2.0, p < .05$, negative emotions $t = -3.3, p < .00$ and anger categories $t = -3.1, p < .00$ within group comparisons for psychological processes. On Day 3, the control group shared multiple emotions during the writing intervention on the topic regarding their favorite time of the year. The responses indicated positive, negative and feelings of anger.

Table 12

Within Groups Analyses for Control Group on Psychological Processes (n=27)

Construct	<i>Day 1</i>		<i>Day 3</i>		t	Sig
	Mean	SD	Mean	SD		
Social Process	4.3	3.4	11.2	6.0	-4.7	.00
Family	.36	.81	.09	.43	2.4	.02
Friends	.29	.74	.21	.48	.41	.69
Humans	.56	.69	1.0	2.4	-.93	.36
Affective Process	5.2	3.6	7.6	2.6	-2.9	.00
Positive Emotions	4.8	3.4	6.5	2.6	-2.0	.05
Negative Emotions	.34	.63	1.2	1.2	-3.3	.00
Anxiety	.13	.36	.10	.43	.33	.75
Anger	.00	.00	.41	.67	-3.1	.00
Sadness	.06	.20	.00	.00	1.4	.16

Table 13 represents the differences between experimental and control group on psychological processes category. The experimental group used more words in their Day 1 essays related to the negative emotions category $t = -6.4, p < .00$; anxiety category $t = -2.3, p < .02$; anger category $t = -3.6, p < .00$ and the sadness category $t = -2.5, p < .01$ (two-tailed) than did the control group. The experimental group indicated mixed emotions in anxiety, anger and sadness when expressing their thoughts on how they felt about mathematics. On Day 3, the experimental group used more words than the control group in their essays related to the negative emotions category $t = -3.0, p < .00$, and the sadness category $t = -2.5, p < .00$. The experimental group appeared to express negative words and words indicating feelings of sadness when writing about their feelings regarding school. The control group used more words in their Day 3 essays related to the social processes category $t = 5.7, p < .00$; affective processes category $t = 2.7, p < .01$; positive emotions category $t = 4.7, p < .00$ and anxiety category $t = -2.4, p < .02$ (two-tailed) than did the experimental group. The control group used words reflecting socialization, positive thoughts and anxiety when writing about their favorite time of the year.

Table 13
Between Groups Analyses for Psychological Processes (n=67)

Construct	Day 1 Experimental			Control			Day 3 Experimental			Control		
	Mean	SD	Sig.	Mean	SD	Sig.	Mean	SD	Sig.	Mean	SD	Sig.
Social Process.	6.1	3.9		4.3	3.4		3.8	2.9		11.1	6.0	
Family	.09	.30	.13	.36	.80	.15	.02	.10	.42	.08	.42	.39
Friends	.13	.32	.35	.28	.74	.95	.00	.05	.48	.20	.48	.05
Humans	.65	.79	.61	.56	.69	.51	.11	.31	2.4	1.0	2.4	.07
Affective Process	5.6	2.3	.54	5.2	3.6	.56	5.8	2.5	2.6	7.6	2.6	.01
Positive Emotion	3.8	2.5	.10	4.8	3.4	1.3	3.4	2.6	2.6	6.5	2.6	.00
Negative Emotion	1.8	1.1	.00	.34	.63	-6.4	2.5	2.2	1.1	1.1	1.1	.00
Anxiety	.41	.61	.02	.12	.35	-2.3	.54	1.0	.42	1.0	.42	.02
Anger	.47	.82	.00	.00	.00	-3.6	.38	.81	.41	.41	.66	.89
Sadness	.31	.55	.01	.05	.20	-2.5	.22	.39	.00	.00	.00	.00

Additional Analyses

Independent samples t-tests were conducted to determine the differences in mean scores on the participants' final VA Math Standard of Learning exam and their final Math course grades after the study was conducted. The Levene's test for Equality of Variance

yielded a significance value of .63 and .46 for analyses conducted using variables, VA Math Standard of Learning Test and final Math course scores, respectively, indicating that equal variances can be assumed. There was no significant difference in mean scores between the experimental ($M = 398.70$ $SD = 32.53$) and control groups ($M = 395.9$, $SD = 37.9$) on the VA Math Standard of Learning exam, $t = -.38$, $p < .71$ (two-tailed). There was no significant difference in mean scores between the experimental ($M = 1.2$, $SD = 1.2$) and control groups ($M = 1.0$, $SD = 1.2$) on final Math course grades, $t = -.7$, $p < .47$ (two-tailed).

CHAPTER V

SUMMARY, CONCLUSIONS, AND FUTURE RESEARCH

Chapter one of this study introduced background studies, introduction of key constructs and concepts, importance of the study, purpose of the study, research questions, assumptions of the study and definition of terms. Chapter two provided review and an introduction of the literature, for expressive writing and cognitive processes, stress, and anxiety. Chapter three discussed the methodology of this study, introduction to the chapter, research questions and hypotheses, participants, instrumentation, methods, and plan for analyzing the data. Chapter IV presents the results from this study. Chapter five presents the research questions, hypotheses, major results, conclusions, discussion and suggestions for further research.

Purpose and Research Design

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress, mathematics anxiety, cognitive processes and psychological using a short term writing intervention. Quantitative research methods were used to explore the effects of the intervention, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research methods were used to analyze the writing samples on cognitive processes, and psychological processes.

Overview of Procedures

The researcher collected the data, formulated a research design and conducted the research with the assistance of the mathematics teaches, school counselors, one administrator, and one technical support person. Five sections of intact geometry classes

were divided with three classes serving as the experimental group and two classes serving as the control group. Permission forms were received from all participants and parents with the understanding that all information was confidential and students could withdraw at anytime during the research without penalty. The PILL, MAACL-R and the MARS-A were the three instruments of measurement. The practice mathematics Virginia standard of learning tests was administered by the teacher, during the pretest and posttest measures. Over a period of three days, the expressive writing intervention was administered to both groups with the experimental group writing on value-laden topics and the control group writing on neutral topics.

Demographics

The final sample consisted of ninety-three participants, males ($n=32$) and females ($n=61$). Participants ranged in age from 14 to 19 ($M=16.56$, $SD=1.03$). Only one participant was classified as a ninth grader, while the other students were in grades 10 ($n=20$, 21.3%), 11 ($n=46$, 48.9%), and 12 ($n=27$, 28.7%). The participants' grade point average on a four point scale ranged from a letter grade of "D" (1.1) to a letter grade of "B-" (2.93). The mean grade was 1.92 with a standard deviation of .41. Reported ethnicities were as follows: 71 (75.5%) were African-American/Non-Hispanic, 17 (18.1%) were Caucasian/Non-Hispanic, 3 (3.2%) were Hispanic, 1 (1.1%) were Asian, 2 (2.1%) were Multiracial. The experimental group consisted of fifty-five participants, and the control group consisted of thirty-nine participants.

Instruments

Data gathering instruments were the Pennebaker Inventory of Limbic Languidness (PILL), Pennebaker (1980) which measures the frequency of general

physical symptoms and sensations associated with stress are experienced. The modified symptom inventory consisted of 20 items. The Math Anxiety Rating Scale (MARS) was developed by Suinn to provide a unidimensional measure of anxiety related to number operations and other mathematical concepts (Suinn, Edie, Nicoletti, & Spinelli, 1972). The Multiple Affect Adjective Checklist-Revised (MAACL-R) developed by Lubin and Zuckerman (1999) measures affective states and traits on three basic scales: Anxiety, Depression, and Hostility. Additional scales on the MAACL-R are composite scores on Dysphoria (raw scores on Anxiety, Depression and Hostility Scales), the Positive Affect and Sensation Seeking –PASS (raw scores of the Positive Affect and Sensation Seeking scales). Qualitative Analysis includes content analysis of writing samples obtained from the experimental and control groups on cognitive and psychological processes. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC-2001), available for computer scoring. Each of the 74 preset LIWC-2001 categories is composed of a list of dictionary words that define that scale (Pennebaker, Francis, Booth, 2001).

Findings and Conclusions

This study explored seven research questions. The results of the detailed statistical analysis of those seven questions are examined in this section. The analytical procedure for each question is presented in this section and the results of the analysis upon the individual hypothesis formulated for each question were presented in the following section.

Research Question One

Research question one stated “What is the effect of expressive writing on stress in a sample of urban high school students?”

Findings:

Experimental Group: Within Group Analyses

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on stress, as assessed by the PILL, for the experimental group. The results indicated that there was no statistically significant difference between the pre test ($M = 8.3$, $SD = 4.4$) and post test ($M = 8.9$, $SD = 4.9$) scores for the experimental group, $t = .97$, $p > .05$ (two-tailed). According to the empirical rule, about 68% of the participants in the experimental group indicated a score range in responses from 3.9 to 12.7 on the pretest and 4.0 to 13.8 during the posttest on stress. The means varied slightly between the pretest and posttest scores on stress as measured by the PILL, but were not statistically significant. The null hypothesis was not rejected.

Control Group: Within Group Analyses

A paired samples t -test was conducted to determine if there was a significant difference between the pretest and posttest scores on stress, as assessed by the PILL, for the control group. The results indicated that there was no statistically significant difference between the pretest ($M = 7.1$, $SD = 4.4$) and posttest ($M = 6.9$, $SD = 4.8$) scores for the control group, $t = .2$, $p > .05$ (two-tailed). Participants in the control group indicated a score range in responses from 2.7 to 11.5 on the pretest and 2.1 to 11.7 on the posttest. The means varied slightly between the pretest and posttest scores on stress as measured by the PILL, but were not statistically significant. The null hypothesis was not rejected.

Pretest Between Groups

A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of stress, as measured by the PILL. The results indicated that there was no statistically significant difference between the two groups, $F(1, 93) = 1.8, p > .05$. The null hypothesis was not rejected.

Posttest Between Groups

A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on stress, as assessed by the PILL, between the experimental group and the control group, on the posttest, using the pretest PILL scores as a covariate. The results indicated that there was no statistically significant difference in post PILL scores between the experimental group and control group, $F(1, 93) = 3.5, p > .05$ partial eta squared = .04. However, there was a 2.0 difference between the experimental group ($M=8.9, SD = 4.9$) and the control group's mean stress scores ($M= 6.9, SD = 4.8$) on the posttest. The null hypothesis was not rejected.

Conclusion

The writing intervention did not have a significant effect on measured stress.

Research Question Two

Research question two stated "What is the effect of expressive writing on general anxiety in a sample of urban high school students?"

Findings:

Experimental Group

A series of paired samples t tests were conducted to determine if there were differences between the pretest and posttest scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, for the experimental group. Results revealed that there were statistically significant differences between the pretest and posttest for the Depression ($t=2.91$, $p<.001$ (two-tailed), Anxiety ($t=3.73$, $p<.001$ (two-tailed), Hostility ($t=3.94$, $p<.001$ (two-tailed), and the Dysphoria composite score ($t=4.52$, $p<.001$ (two-tailed). Pretest score on the Depression subscale ($M = 52.3$, $SD = 10.1$), posttest score ($M = 46.7$, $SD = 8.5$), pretest score on the Anxiety subscale ($M = 52.3$, $SD = 10.3$), posttest score ($M = 45.5$, $SD = 8.9$), pretest score on the Hostility subscale ($M = 52.8$, $SD = 8.9$), posttest score ($M = 47.3$, $SD = 8.7$), and the pretest score on the Dysphoria composite score ($M = 53.4$, $SD = 8.7$), posttest score ($M = 46.3$, $SD = 8.5$). No significant differences between the pretest and posttest were found for the Positive Affect ($t = -1.88$, $p>.05$ (two-tailed), Sensation Seeking ($t = .79$, $p>.05$ (two-tailed) , and PASS composite scores ($t = -1.80$, $p>.05$ (two-tailed) pretest score on the Positive Affect composite score ($M = 42.8$, $SD = 10.9$), posttest score ($M = 46.5$, $SD = 11.9$), pretest score on the Sensation Seeking composite score ($M = 59.2$, $SD = 14.1$), posttest score ($M = 56.6$, $SD = 18.9$), and pretest score on the PASS composite score ($M = 49.8$, $SD = 10.8$), posttest score ($M = 53.4$, $SD = 12.4$). Although all scales and sub-scales did not show significant differences, the null hypothesis was rejected as there was a significant reduction in anxiety.

Control Group

A series of paired samples t tests were conducted to determine if there were differences between the pretest and posttest scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, for the control group. Results revealed that there was a statistically significant difference between the pretest and posttest found for the Hostility subscale, ($t = 1.5, p < .05$ (two-tailed)). Pretest score on the Hostility subscale ($M = 50.0, SD = 7.9$), posttest score ($M = 47.6, SD = 9.0$). No significant differences between the pretest and posttest were found for the Depression ($t = 1.0, p > .05$ (two-tailed)), Anxiety ($t = -1.2, p > .05$ (two-tailed)), Positive Affect ($t = -.93, p > .05$ (two-tailed)), Sensation Seeking ($t = .98, p > .05$ (two-tailed)), Dysphoria ($t = .65, p > .05$ (two-tailed)), and PASS composite scores ($t = -1.22, p > .05$ (two-tailed)). Pretest score on the Depression subscale ($M = 48.2, SD = 7.2$), posttest score ($M = 46.6, SD = 8.8$), pretest score on the Anxiety subscale ($M = 47.4, SD = 7.5$), posttest score ($M = 49.8, SD = 12.2$), pretest score on the Positive Affect composite score ($M = 44.1, SD = 11.3$), posttest score ($M = 46.0, SD = 10.6$), pretest score on the Sensation Seeking composite score ($M = 57.6, SD = 16.0$), posttest score ($M = 54.3, SD = 21.7$), pretest score on the Dysphoria composite score ($M = 48.3, SD = 7.1$), posttest score ($M = 47.3, SD = 9.1$), and pretest score on the PASS composite score ($M = 51.7, SD = 14.0$), posttest score ($M = 54.6, SD = 12.4$). The null hypothesis was not rejected.

Pretest Between Groups

A series of one-way analysis of variances (ANOVAs) were conducted to determine if there was a significant difference between the experimental group and the

control group on pre-test scores of general anxiety, as measured by the MAACL-R subscales (Depression, Anxiety, and Hostility) and composite scores (Positive Affect, Sensation Seeking, Dysphoria, and PASS). Results revealed statistically significant pretest differences between the experimental group and control groups on the subscale Depression [$F(1, 93) = 4.9, p < .05$, partial eta squared = .00], the subscale Anxiety [$F(1, 93) = 6.4, p < .05$, partial eta squared = .06], and the composite score Dysphoria [$F(1, 93) = 9.2, p < .05$, partial eta squared = .09]. The results indicated that there was no statistically significant difference between the experimental and control groups on pretest results of Hostility [$F(1, 93) = 2.4, p > .05$, partial eta squared = .02], , Positive Affect [$F(1, 93) = .22, p > .05$, partial eta squared = .00], Sensation Seeking [$F(1, 93) = .27, p > .05$, partial eta squared = .00], and PASS [$F(1, 93) = .44, p > .05$, partial eta squared = .00]. The null hypothesis was rejected for comparisons on anxiety for the experimental and control groups.

Posttest Between Groups

A series of analysis of covariances (ANCOVAs) were conducted to determine the difference between the experimental and control groups post test scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, using their respective pre test scores as covariates. Differences between the experimental and control group post test results reached statistical significance for the Anxiety subscale [$F(1, 93) = 3.8, p = .05$, partial eta squared = .04]. Results revealed there were no statistically significant differences found between the experimental and control groups post test results on the subscale Depression [$F(1, 93) = .00, p > .05$, partial eta squared = .00], the subscale Hostility [$F(1,$

93) = .02, $p > .05$, partial eta squared = .00], the composite score Positive Affect
 [F(1, 93) = .10, $p > .05$, partial eta squared = .00], the composite score Sensation Seeking
 [F(1, 93) = .22, $p > .05$, partial eta squared = .00], the composite score Dysphoria
 [F(1, 93) = 1.08, $p > .05$, partial eta squared = .01], and the composite score PASS
 [F(1, 93) = .05, $p > .05$, partial eta squared = .00]. The null hypothesis was rejected for anxiety.

Conclusion

The expressive writing intervention appeared to be effective as evidenced by statistically significant results indicating the experimental group reported decreased levels of depression, anxiety, hostility, and dysphoria from pre-test to post test. When compared to the control group and controlling for pre-test scores, statistically significant results revealed the experimental group reported lesser levels of anxiety. Additionally, the experimental group indicated higher levels in depression, sensation seeking, and positive affect with lower levels of hostility, dysphoria and PASS when compared to the control group. The control group indicated higher levels in hostility dysphoria, and PASS and lower levels in positive affect, depression and sensation seeking than the experimental group, though not statistically significant.

Research Question Three

Research question three stated “What is the effect of expressive writing on mathematics anxiety in a sample of urban high school students?”

Findings:

Experimental Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on math anxiety, as assessed by the MARS, for the experimental group. The results indicated that there was a statistically significant difference between the pretest ($M = 232.7$, $SD = 74.5$) and posttest ($M = 218.8$, $SD = 77.7$) scores for the experimental group, $t = 2.03$, $p < .05$ (two-tailed). There was a decrease of 13.9 in the mean scores for math anxiety, from pretest to posttest. The null hypothesis was rejected.

Control Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on math anxiety, as assessed by the MARS, for the control group. The results indicated that there was no statistically significant difference between the pretest ($M = 209.3$, $SD = 71.9$) and posttest ($M = 196.8$, $SD = 71.6$) scores for the control group, $t = 1.4$, $p > .05$ (two-tailed). However, there was a 12.5 decrease in the mean scores on math anxiety, from pretest to posttest. There was a wide range of dispersion in scores on the math anxiety scores ranging from 137.4 to 281.2 between the pretest and posttest scores, as assessed by the MARS, for the control group. The null hypothesis was not rejected.

Between Groups Pretest

A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of math anxiety, as measured by the MARS. The results indicated that

there was no statistically significant difference between the two groups, $F(1, 93) = 2.3$, $p > .05$. However, results revealed that the experimental group reported more math anxiety as evidenced by them having a higher mean math anxiety score ($M = 232.7$, $SD = 74.5$) than the control group ($M = 209.3$, $SD = 71.9$). Math anxiety scores for the experimental group ranged from 158.2 to 307.2 and for the control group 137.4 to 281.2, as assessed by the MARS between groups on the pretest. The means varied between the pretest scores between the experimental group and the control group but were not statistically significant. The null hypothesis was not rejected.

Between Groups Posttest

A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on anxiety, as assessed by the MARS, between the experimental group and the control group, on the posttest, using the pretest MARS scores as a covariate. The results indicated that there was no statistically significant difference in post MARS scores between the experimental group ($M = 218.8$, $SD = 77.7$) and control group ($M = 196.8$, $SD = 71.6$), $F(1, 93) = 1.9$, $p > .05$, partial eta squared = .02. However, there was a 22 point difference between the experimental group and the control groups mean anxiety scores on the post test. Math anxiety scores for the experimental group ranged from 141.1 to 296.5 and for the control group 125.2 to 268.4 between groups on the posttest as assessed by the MARS. There was a significant dispersement in ranges but they were not statistically significant. The null hypothesis was not rejected.

Conclusion

Results concerning the expressive writing intervention's effectiveness in decreasing math anxiety in this sample appeared to be mixed. There were no statistically

significant differences found between the experimental and control groups pre-intervention. The expressive writing intervention appeared to be effective in reducing math anxiety as evidenced by the experimental group reporting statistically significant decreased levels of math anxiety, pretest to posttest. When comparing the experimental group to the control group and controlling for pretest scores, no statistically significant difference was found.

Research Question Four

Research question four stated “What is the effect of expressive writing on mathematics test scores in a sample of urban high school students?”

Findings:

Experimental Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on the Mathematics’ Practice Standard of Learning Test for the experimental group. The results indicated that there was no statistically significant difference between the pretest and posttest scores for the experimental group, $t = .85$, $p > .05$. Mean scores on the Mathematics’ Practice Standard of Learning Test decreased by 4.5 points pre test ($M = 50.3$, $SD = 18.7$) to post test ($M = 45.8$, $SD = 13.3$). Participants’ scores ranged from 31.6 to 69.0 on the pretest and 32.5 to 59.1 on the posttest for the experimental group as assessed by the Mathematics’ Practice Standard of Learning Test. The means varied slightly between the pretest and posttest scores on math scores as measured by the Mathematics’ Practice Standard of Learning Test but were not statistically significant. The null hypothesis was not rejected.

Control Group

A paired samples t -test was conducted to determine if there was a significant difference between the pretest and posttest mathematics scores, as assessed by the Mathematics' Practice Standard of Learning Test, for the control group. The results indicated that there was no statistically significant difference between the pre test and post test scores for the control group, $t = .85$, $p > .05$. Mean scores on the Mathematics' Practice Standard of Learning Test decreased by 7.7 points from pre test ($M = 55.1$, $SD = 17.4$) to posttest ($M = 47.4$, $SD = 15.1$). Participants' scores ranged from 37.7 to 72.5 on the pretest and 32.3 to 62.5 on the posttest for the control group as assessed by the Mathematics' Practice Standard of Learning Test. The means decreased slightly between the pretest and posttest math scores as measured by the Mathematics' Practice Standard of Learning Test but were not statistically significant. The null hypothesis was rejected.

Pretest Between Groups

A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest mathematics test scores, as measured by the Mathematics' Practice Standard of Learning Test. The results indicated that there was no statistically significant difference between the experimental group ($M = 50.3$, $SD = 18.7$) and the control group ($M = 55.1$, $SD = 17.4$), $F(1, 93) = 1.4$, $p > .05$. However, results revealed that the control group scored higher on the Mathematics' Practice Standard of Learning Test than the experimental group. The means varied slightly between the pretest scores between the experimental group and the control group on pretest math scores, as measured by the

Mathematics' Practice Standard of Learning Test, but were not statistically significant.

The null hypothesis was not rejected.

Posttest Between Groups

A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on mathematics scores, as assessed by the Mathematics' Practice Standard of Learning Test, between the experimental group and the control group, on the posttest, using the pretest Mathematics' Practice Standard of Learning Test scores as a covariate. The results indicated that there was no statistically significant difference in post Mathematics' Practice Standard of Learning Test scores between the experimental group ($M = 45.8$, $SD = 13.3$), and control group ($M = 47.4$, $SD = 15.1$), $F(1, 93) = .24$, $p > .05$, partial eta squared = .00. Further examination of the results revealed the control group scored higher on the Mathematics' Practice Standard of Learning Test at post test than the experimental group, when controlling for pretest scores. The means varied slightly between the posttest scores between the experimental group and the control group on math scores with the control group scoring higher, as measured by the Mathematics' Practice Standard of Learning Test, but were not statistically significant. The null hypothesis was not rejected.

Conclusion

The expressive writing intervention did not appear to be effective in increasing mathematics scores in this study. There were no statistical significant differences found between the experimental and control groups pre-intervention. Following the implementation of the expressive writing intervention, the experimental group and the control group did not report statistically significant differences in their mathematics

scores. However, both groups experienced decreases in their mathematics scores from pretest to posttest, though not statistically significant. When comparing the experimental group to the control group and controlling for pretest scores, no statistically significant difference was found; yet the control group had higher mean mathematics scores than the experimental group.

Research Question Five

Research question five stated “What is the relationship between the predictor variables, group membership (experimental and control) stress, general anxiety, math anxiety, and previous mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students?”

Finding:

Standard multiple regression was used to assess the contribution of the predictor variables (e.g., group membership, posttest scores on the PILL, MAACL-R, and the MARS-A, and the pre-test scores of the VA Math Practice SOL) on the outcome variable, the posttest scores on the VA Math Practice SOL. The regression model was not statistically significant, $F(5, 67) = 1.82, p > .05$; adjusted R square = .054. When evaluating the predictor variables individually, the pretest scores on the VA Math Practice SOL made a significant and unique contribution to explaining the outcome variable, November VA Math Practice SOL, when the variance explained by all the other predictor variables are controlled ($\beta = .28, p < .02$). The null hypothesis was not rejected.

Additional Analysis

An additional analysis, a one-way between groups MANCOVA, was conducted to investigate the differences between the experimental and control groups on the posttest scores for the VA Math Practice SOL, PILL, MARS-A, and the MAACL-R. Preliminary assumptions' testing was performed to check for normality, linearity, outliers, homogeneity of variance, and multicollinearity; no serious violations were noted.

Finding:

Between Groups

There were no statistically significant differences found between the experimental and control groups on the combined dependent variables, $F(4, 70) = .18, p < .95$; Wilks' Lambda = .99; partial eta squared < .01. The experimental group had higher means on the PILL ($M = 8.78, SD = 4.9$), MARS-A ($M = 223.20, SD = 79.1$), than the control group ($M = 6.67, SD = 4.1$), ($M = 194.82, SD = 72.5$). Ancillary analyses revealed no statistically significant differences between the experimental group and control group when collectively considering posttest mathematics scores, anxiety scores, general anxiety scores, and mathematics anxiety scores.

Conclusion

Regardless of whether the participants were in the experimental or control group and their levels of stress, general and mathematics anxiety, only previous mathematics performance appeared to contribute to the participants' later mathematics performance. Results indicate the better previous mathematics performance is the better later mathematics performance will be. In this study, expressive writing did not appear to be

an effective intervention in improving mathematics performance although other studies have shown gains in academic achievement with its implementation.

Research Question Six

Research question six stated “Is there a significant difference within group comparison for the experimental group in the cognitive processes category in a sample of urban high school students’ expressive writing samples?”

Finding:

Cognitive Processes

Experimental Group

A series of paired samples t tests were conducted to determine if there were significant differences between the experimental groups mean scores Day 1 to Day 3 on cognitive processes scores. Results revealed that there was a statically significant difference between Day 1 and Day 3 mean scores essays for the essays for the Insight subcategory, $t = -3.4$, $p < .001$, (two-tailed). Differences between mean scores on Day 1 and Day 3 essays for the Cognitive processes subcategory reached statistical significance, $t = -2.0$, $p = .05$, (two-tailed).

No significant differences between Day 1 and Day 3 essays were found for other measured cognitive processes.

Control Group

A series of paired samples t- tests were conducted to determine if there were significant differences between the control groups mean scores on Day 1 to Day 3 cognitive processes scores. Statistically significant differences were found between Day

1 and Day 3 mean scores on Cognitive Processes, $t = -2.3$, $p < .05$ (two-tailed); Insight $t = -3.7$, $p < .001$ (two-tailed); and Causation, $t = 2.5$, $p < .05$ (two-tailed).

No significant differences between Day 1 and Day 3 essays were found for other measured processes.

Between Groups

A series of independent samples t -tests were conducted to determine if there were significant differences between the experimental and control group's mean scores on Day 1 and Day 3 on cognitive processes scores. For Day 1, statistically significant differences between the experimental group and the control group were found for the subcategories Cognitive Processes, $t = -2.7$, $p < .05$ (two-tailed); Insight ($t = -4.7$, $p < .05$ (two-tailed), Tentative, $t = -2.8$, $p < .05$ (two-tailed); Inclusive, $t = 2.0$, $p < .05$ (two-tailed) and Exclusive, $t = -3.6$, $p < .05$ (two-tailed). For Day 3, statistically significant differences between the experimental and control groups were found for subcategories Insight, $t = 2.7$, $p < .05$ (two-tailed); Inclusive, $t = 2.4$, $p < .05$ (two-tailed) and Exclusive, $t = -3.0$, $p < .05$ (two-tailed). Of the statistically significant differences, the experimental group reported higher levels for all the subcategories except for the Inclusive subcategory.

Conclusion

The experimental group was able to process and express their thoughts in areas of discussion with words reflecting organizing their thought patterns as they were writing on how they felt about math. They used words indicating what they knew and considered possibilities as evidenced by their use of exclusive words and their feelings about a subject in which the performance for them was low. The control group used more words

connecting and giving examples as evident of their use of inclusive words as they wrote about their plans after high school.

Research Question Seven

Research question seven stated “Is there a significant difference within group comparison for the experimental group in the psychological processes category in a sample of urban high school students’ expressive writing samples?”

Finding:

Psychological Processes

Experimental Group

A series of paired samples t- tests were conducted to determine if there were significant differences between the experimental groups mean scores Day 1 to Day 3 on psychological processes. Statistically significant differences between Day 1 and Day 3 mean scores were found for Social Processes, $t = 3.5$, $p < .05$ (two-tailed); Friends, $t = 2.5$, $p < .05$, (two-tailed); and Humans, $t = 4.0$, $p < .05$ (two-tailed).

No significant differences between Day 1 and Day 3 mean scores were found for other psychological processes.

Control Group

A series of paired samples t tests were conducted to determine if there were significant differences between the control groups mean scores Day 1 to Day 3 for psychological processes. Statistically significant differences between Day 1 and Day 3 mean scores were found for Social Processes, $t = -4.7$, $p < .05$ (two-tailed); Family, $t = 2.4$, $p < .05$, (two-tailed); Affective Processes , $t = -2.9$, $p < .05$, (two-tailed); Negative Emotions, $t = -3.3$, $p < .05$ (two-tailed); and Anger, $t = -3.1$, $p < .05$ (two-tailed).

Differences between Day 1 for the Positive Emotions subcategory reached statistical significance, $t = -2.0$, $p = .05$, (two-tailed).

No significant differences between Day 1 and Day 3 mean scores on other psychological processes were found.

Between Groups

A series of independent samples t -tests were conducted to determine if there were significant differences between the experimental and control group mean scores on Day 1 and Day 3 psychological processes. For Day 1, statistically significant differences between the experimental group and the control group were found for the subcategories Negative Emotions, $t = -6.4$, $p < .05$ (two-tailed); Anxiety, $t = -2.3$, $p < .05$ (two-tailed); Anger, $t = -3.6$, $p < .05$ (two-tailed) and Sadness, $t = -2.5$, $p < .05$ (two-tailed). The experimental group scored higher in all categories. For Day 3, statistically significant differences between the experimental and control groups were found for subcategories Social Processes, $t = 5.7$, $p < .05$ (two-tailed); Affective Processes, $t = 2.7$, $p < .05$ (two-tailed); Positive Emotion, $t = 4.7$, $p < .05$ (two-tailed); Negative Emotion, $t = -3.0$, $p < .05$ (two-tailed); Anxiety, $t = -2.4$, $p < .05$ (two-tailed) and Sadness, $t = -3.5$, $p < .05$ (two-tailed).

Conclusion

The experimental group used more negative words and words expressing anger, anxiety and sadness on both day one and day three. Day one asked about their feelings about mathematics and day three asked about their feelings about school. The control group used more positive words and happy words in their writing with some indication of anxiety. Their topic for day three was on their favorite time of the year.

Summary of Findings

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress, mathematics anxiety, cognitive processes and psychological using a short term writing intervention. Results of this study indicate that a decrease in stress, and anxiety could result in increased academic performance. Allowing students an opportunity to express their cognitive and psychological thoughts allows teachers an opportunity to assess student's needs. A brief summary of each of these areas noted below, explains the results from each topic.

Stress: The experimental group disclosed emotional feelings about the value-laden topics during the writing intervention which may have attributed to the experimental group's higher levels of stress during this study. Although the stress level of the experimental group did not increase much, it was evident when reviewing their emotional responses on the expressive writing intervention. Participants in the control group reported decreased levels of stress from pretest to posttest. The control group wrote about neutral topics which did not provoke emotional feelings. Results indicate there is a level of stress experienced by students and this study will serve as an area to be considered when working with adolescents.

General Anxiety: The expressive writing intervention was effective as evidenced by statistically significant results indicating that the experimental group reported decreased levels of anxiety. In addition, the scales measuring depression, anxiety, hostility, and dysphoria also decreased from pretest to posttest. When compared to the control group and controlling for pretest scores, statistically significant results revealed the experimental group reported lesser levels of anxiety after the writing intervention.

Math Anxiety: Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. The expressive writing appeared to be therapeutic for both groups whether they wrote on a value-laden topic or a neutral topic.

Practice Mathematics Virginia Standards of Learning: Students enrolled in a geometry class must take the Virginia Standards of Learning Test at the end of the course. Participants in this study took the practice SOL mathematics test which was a group of questions, put together by the mathematics' department, from the State department release tests items from previous geometry SOLs. Passing benchmark scores range between 62% - 100%, middle scores range between 51% - 61%, and failing scores range between 0% - 50%. Prior to the expressive writing intervention, participants in the experimental group had a 24% pass rate, with 28% falling in the middle range and 48% falling below the benchmark. After the expressive writing intervention the experimental group had a 12% pass rate, with 31% falling in the middle range and 57% falling below the benchmark. Prior to the expressive writing intervention participants in the control group had a 38% pass rate, with 31% falling in the middle range and 31% falling below the benchmark. After the writing intervention, the control group has a 19% pass rate, with 22% falling in the middle range and 59% falling below the benchmark. Both groups showed a decrease in the pass rate, and an increase in the below the benchmark rate.

Scale scores on the SOLs are 500-600 for pass/advanced, 400-500 for pass/proficient, and 0-399 for failing score. In high school, students scoring in the expedited category ranging between 375 and 399, are allowed to re-test during the same testing window to increase chances for passing. During the SOL Test, the expressive

writing group had a 52% pass rate, 48% failure rate with 39% of participants from the failure group falling in the expedited re-take range. The control group had a 49% pass rate, 51% failure rate with 27% falling in the expedited re-take range. Overall the school had a 49% pass rate in geometry during the January 2010 testing cycle and a 47% pass rate during the January 2011 testing cycle indicating a slight decrease in comparison of overall mid-year scores.

Cognitive Processes: The experimental group was able to process their thoughts in areas of written expression, organizing their thought patterns as they were writing on how they felt about math. They used words indicating what they knew and considered possibilities as evidenced by their use of exclusive words regarding their feelings about a subject where the assessment resulting in low math performance. The control group used more words connecting and giving examples evident by their use of inclusive words as they wrote about their plans after high school.

Psychological Processes: The experimental group used more negative words and words expressing anger, anxiety and sadness on both day one and day three. Day one asked about their feelings about mathematics and day three asked about their feelings about school. The control group used more positive words and happy words in their writing with some indication of anxiety. Their topic for day three was on their favorite time of the year, a neutral topic, allowing them to express positive thoughts on something they enjoyed.

Relationship to Prior Studies

Results indicated 2.0 differences between the experimental group and the control group's mean stress scores. Research examining the relationship between stressful life events, internalized symptoms of stress and academic achievement among a sample of

Hispanic students in a large urban high school concluded that psychosocial stress and cognitive self-competence were found to have significant main effects in predicting the outcome of grades. This study also found that students experiencing high levels of psychosocial stress did poorly in school (Alva, & Reyes, 1999). Lazarus (1986) put forth the concept that stress is dependent upon the relationship between the individual and a particular environment. Without a consensus on the definition of stress there is wide agreement that stress can have a negative physical and psychological effect on the body. One of the most prevalent factors effecting student well being and academic outcome is stress.

The expressive writing intervention appeared to be effective as evidenced by statistically significant results indicating the experimental group reported decreased levels of depression, anxiety, hostility, and dysphoria from pre-test to post test. When compared to the control group and controlling for pre-test scores, statistically significant results revealed the experimental group reported lesser levels of anxiety. Additionally, the experimental group indicated higher levels in depression, sensation seeking, and positive affect with lower levels of hostility, dysphoria and PASS when compared to the control group. The control group indicated higher levels in hostility dysphoria, and PASS and lower levels in positive affect, depression and sensation seeking than the experimental group, though not statistically significant.

The international literature widely accepts that anxiety disorders are prevalent and demonstrate significantly varied patterns as Somers, Goldner, Waraich, and Hsu confirm in their review of the prevalence and incidence studies of anxiety disorders (2006). The majority of studies restricted to the adult population reviewed by Somers, et al., (2006)

revealed that anxiety disorders are twice as widespread among women and indicated “a burden of illness” associated with anxiety disorders reported overall. Investigations of anxiety disorders among children and adolescents also consistently demonstrate the prevalence of anxiety disorders and related distress and impairment and advances are helping to close the gap between what is known and what remains to be learned (Ollendick et. al, 1994).

Results concerning the expressive writing intervention’s effectiveness in decreasing math anxiety in this sample appeared to be mixed. There were no statistically significant differences found between the experimental and control groups pre-intervention. The expressive writing intervention appeared to be effective in reducing math anxiety as evidenced by the experimental group reporting statistically significant decreased levels of math anxiety, pretest to posttest. When comparing the experimental group to the control group and controlling for pretest scores, no statistically significant difference was found.

Math anxiety interrupts cognitive processing by conceding working memory activity (Ashcraft, 2002; Beilock, 2008), offering some understanding about poor performance and individual differences in experiences with math anxiety. Highly anxious students in stressful situations may be more susceptible to unwanted failure in math despite often showing competency in other areas (Beilock, 2008). Math anxiety and overall intelligence is only weakly related given the minor correlation of $-.17$ between math anxiety and intelligence, especially when the quantitative aspect of intelligence testing is considered (Ashcraft, 2002).

Following the implementation of the expressive writing intervention, the experimental group and the control group did not report statistically significant differences in their mathematics scores. However, both groups experienced decreases in their mathematics scores from pretest to posttest, though not statistically significant. When comparing the experimental group to the control group and controlling for pretest scores, no statistically significant difference was found; yet the control group had higher mean mathematics scores than the experimental group. As students become less anxious about their math performance, they may make less careless mistakes on the various types of computations (Beilock, 2008), their test scores may improve, and they can be better prepared for the future while experiencing more confidence in their approach to learning. Research by Frattaroli, Thomas, and Lyubomirsky, 2010 looked at whether experimental disclosure through expressive writing, could improve exam performance and psychological health in students taking a graduate school entrance exam. One hundred four students (70% women, $M = 20.98$ years) scheduled to take the GRE-General ($n = 48$), MCAT ($n = 38$), LSAT ($n = 15$), GRE-Subject ($n = 2$), or Pharmacy College Admissions Test (PCAT) ($n = 1$) were randomly assigned to write expressively about their upcoming exam or to a neutral writing condition. Research indicated that the experimental disclosure group had significantly higher test scores and significantly lower pre-exam depressive symptoms than the neutral writing group. The researchers noted that benefits for depressive symptoms were found in expressive writers regardless of exam type, the advantage of expressive writing for test performance was only observed in students taking the MCAT or LSAT.

Consistent significant associations, across grade levels, between prior poor math achievement and later math anxiety have been demonstrated by Ma and Xu (2004) using structural equation modeling. Prior math achievement and later math achievement were significantly related across the six grade levels (from 0.91 to 0.98) whereas the stability effects for prior math anxiety on later math anxiety were weaker (0.39 to 0.57). However, the stability effects for math anxiety became more pronounced from grade eight (0.55 to 0.59) and impacted later math anxiety consistently across later grade levels. Prior high levels of math anxiety relating to later poor math achievement were not statistically significant beginning with the ninth grade.

Reviewing results from the writing analyses indicted the experimental group, in between group comparisons, used more negative words and words expressing anger, anxiety and sadness on both day one and day three. Day one asked about their feelings about mathematics and day three asked about their feelings about school. The control group, in between group comparisons, used more positive words and happy words in their writing with some indication of anxiety. Their topic for day three was on their favorite time of the year.

The degree to which people express emotions and how they express emotions can tell what they are experiences (Tausczik & Pennebaker, 2010). Use of emotion words has also been used as a measure of the degree of immersion. Holmes et al. (2007) found that among women trying to cope with intimate partner violence, using more positive and negative emotion words to describe the violence led to increased feelings of physical pain over the four writing sessions. The authors conclude that higher use of emotion words

showed more immersion in the traumatic event, which led to increased experience of physical pain.

In research involving four classes of eighth-grade students in a suburban middle school health course were randomly assigned to write about either an emotional or neutral topic in an expressive writing intervention for adolescents' somatic symptoms and mood study conducted by Soliday, Garofolo, and Rogers (2004). Their research revealed advantages of using expressive writing as a cost efficient intervention to attend to the emotional worries of adolescents.

Significant differences were found between Day 1 and Day 3 mean scores within group comparison for both the control and experimental group on cognitive processes on the writing analyses. Between groups comparisons indicated significant difference on Day 1 for cognitive processes. Smyth et al. (2001) posits that narrative formation and coherence are necessary for expressive writing to be beneficial. Harber and Pennebaker (1992) explain that cognitive processing helps to organize and structure the memory and therefore creates a more adaptive schema related to the traumatic or stressful event.

Both the control group and experimental group, between group comparisons, indicated significant differences in their use of exclusive words from Day 1 to Day 3. Exclusive words (e.g., but, without, exclude) are helpful in making distinctions. Indeed, people use exclusion words when they are attempting to make a distinction between what is in a category and what is not in a category. Exclusive words are used at higher rates among people telling the truth (Newman et al., 2003) and by Gore compared with Kerry and Edwards (Pennebaker, Slatcher, & Chung, 2005).

The control group indicated significant between group differences in the use of casual words between Day 1 and Day 3 on cognitive processes. Results for the experimental group and control, within groups and between group differences, revealed that there was a statically significant difference between Day 1 and Day 3 mean scores essays for the Insight subcategory. The use of causal words (e.g., because, effect, hence) and insight words (e.g., think, know, consider), two subcategories of cognitive mechanisms, in describing a past event can suggest the active process of reappraisal. In a reanalysis of six expressive writing studies, Pennebaker, Mayne, and Francis (1997) found that increasing use of causal and insight words led to greater health improvements. This finding suggests that changing from not processing to actively processing an event in combination of emotional writing leads to better outcomes. In these experiments, increasing use of casual and insight words may be analogous to making reconstrual statements. In other work, use of reconstrual in combination with discussion of a traumatic event has shown to have the best health outcomes (Kross & Ayduk, 2008). Participants in describing a painful relationship breakup used more cognitive mechanisms, particularly causal words, in describing the breakup and post-breakup compared with the pre-breakup (Boals & Klein, 2005). The authors argue that causal words are used in the most traumatic parts, the breakup and post-breakup, because they are being used to create causal explanations to organize the participant's thoughts.

When comparing between groups for cognitive processes, there was a significant difference on Day 1 on the tentative category. When people are uncertain or insecure about the topic, they use tentative language (e.g. maybe, perhaps, guess) and more filler words such as I mean, and you know. The higher use of tentative words suggests that an

individual has not yet processed an event and formed it into a story (Pasupahi, 2007).

Possibly, higher use of tentative words suggests that a participant has not yet processed an event and formed it into a story.

Limitations of the Study

The timeframe for the intervention was a limitation due to school activities which included grade level assemblies, field trips, homecoming activities, marking period review, and students out for teacher work day grading period. Individual results were not analyzed during this study. With the exception of one intact class, the alternate schedule did not allow researcher an opportunity to administer the writing intervention for three consecutive days as noted in the original expressive writing protocol by Pennebaker and Beal (1986).

Additional limitations included awaiting the division's approval after receiving approval from the IRB at Old Dominion University. This resulted in a delay in starting the research. Due the late start of the research, the researcher had to work around the school's schedule. Student attendance was a factor which did not allow administering of instruments to all students when scheduled. Researcher sent for students during other class periods and held small groups after school. Permission forms were not returned resulting in frequent reminders, telephone calls to parents, pulling students from other classes, and soliciting support from school counselors.

An additional limitation that may have influenced the outcomes is that the students received additional support services after the writing samples from the experimental group regarding their feelings about mathematics were read. Both the experimental and control groups received the services. The essays had themes that indicated their fear of failing the state test, insecurity of understanding mathematical

concepts and despair over self-efficacy and self-competency. While intervening to aid the students was a professional responsibility, it also presented ethical dilemma of proceeding with research or stopping to assist participants. The Chair of the Dissertation Committee was consulted and the decision was made to offer the additional support services. Permission was given to support the students' needs noting the ethical obligation of meeting the needs of participants when one discovers existing psychological concerns or issues arising during research.

The sample size, power and significance detecting a medium was not met with this research study ($n=47$). Cohen suggests an N of 64; for a large difference at the same power level, an N of 26 is suggested. To detect a medium difference at power .80 for a multiple regression, 84 and 91 participants are suggested for four and five independent variables, respectively.

Data collection instrument limitations, such as the length of the MARS-A (98 items) and MAACL-R (132 adjectives), may have altered the accuracy of the responses, an instrumentation threat. Examinee motivation on instruments, particularly those who may experience test anxiety, can be impacted by test length, Taylor and Deane (2002). Although the MARS-A was used in conjunction with the MAACL-R with an adapted version, students complained about the length of both instruments. Students did not complain while responding to the modified version of the PILL, which was 20 items, but had questions about some of the symptoms.

In spite of the limitations noted on the research, the study contributes useful information, though the findings are not consistent with much of the previous research. These studies also added to the research of knowledge as well as provide information that

can be potentially helpful in understanding the relationship of these variables of stress, anxiety, math anxiety, cognitive and psychological processes to the Virginia Standard of Learning mathematics' performance for high school students.

Discussion

Expressive writing is a brief writing intervention that has shown positive outcomes on a variety of subjects for a variety of conditions. When the researcher first approached the lead math teacher about the expressive writing intervention and teaching the second part of the geometry course during first semester, the idea was met with opposition. It was expressed that students should retake the entire course and take the SOL test during the spring administration in May. After consulting with the principal, on possible advantages of not waiting, the decision was made to offer the course during the first semester to benefit students.

During the expressive writing intervention, students met the researcher in one of the computer labs and completed the first writing topic. On Day 1, the experimental group was asked about their feelings towards mathematics. Participants began to write immediately, non-stop. The level of engagement generated teacher's comments regarding how eager they were in responding to the topic. The students' willingness to share their thoughts resulted in the researcher reading the results immediately that evening after school. After reading each essay, information shared from the experimental group indicated a sense of hopelessness regarding their past and previous math performance. For the researcher, the expressive writing exercise confirmed the importance of giving students a voice and listening to their needs. The researcher felt compelled to share the overall comments with the chair of the dissertation committee

inquiring if and what support could be given to students. After collaboration, the researcher was encouraged to move forward in assisting students. A team of educators were called for a meeting consisting of the division's math supervisor, the math coach and the teachers of the course. Results from the meeting yielded strategies for students in both the experimental and control group which included tutorial during school, with necessary pull-outs from other classes, and Saturday school. Teachers were willing to hold the sessions at the school or at a site in the community. Willingness of the teacher's response indicated their commitment to utilize information from the expressive writing intervention to help students reduce their anxiety. Results from the expressive writing intervention indicated the student's fear of failing the state test, insecurity of understanding mathematical concepts, despair over self-efficacy and self-competency, and a strong desire to receive a high school diploma all adding to the levels of the student's emotional anxiety.

Anxiety

The expressive writing intervention was effective, as evidenced by statistically significant results for the experimental group in reducing anxiety within group comparison from pretest to posttest. The posttest between group comparisons indicated statistical significance in anxiety with a reduction in anxiety for the experimental group with an increase in anxiety for the control group. In an effort to improve academic performance, allowing students an opportunity to express their feelings, could initiate early interventions from teachers and counselors in reducing anxiety strategies. Anxiety is a prevalent problem among young people. Although identification and treatment of anxiety occurs often during early adulthood, approximately half of those treated for

anxiety indicate an earlier onset during childhood or adolescent years (APA, 2000).

High test anxious individuals experience physiological changes (e.g., increased heart rate) and the negative emotional reactions of state anxiety, triggering them to attempt to avoid or minimize the testing threat, depending on the degree to which a test is viewed as being threatening (Spielberger, 1995).

Math Anxiety

Results from the pretest to posttest within group comparison indicated the expressive writing intervention was effective in reducing math anxiety as evidenced by the experimental group reporting statistically significant decreased levels of math anxiety. Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. The expressive writing appeared to be therapeutic for both groups whether they wrote on a value-laden topic or a neutral topic. Math anxiety is consistently related to math performance (e.g., Hembree, 1990; Liebert & Morris, 1967; Hsiu-Zu, et al., 2000). Researchers have found correlations commonly within the $-.11$ to $-.36$ range, a small negative relationship pointing out that students with higher levels of math anxiety are inclined to have lower levels of math performance (e.g., Hembree, 1990; Ma, 1999). Math anxiety, according to numerous studies (e.g., Betz, 1978, Hembree, 1990; Liebert & Morris, 1967; Ma, 1999,) has been found to have a consistent but small negative relationship with math achievement with students experiencing high levels of math anxiety performing at lower mathematic levels academically.

Math anxiety may pose a concern for career and technical educational students because many students suffering from math anxiety have little confidence in their ability

to do math, and tend to take a minimum number of required math courses; this limits their career choice options (Scarpello, 2007). It is also noted by Scarpello, that math anxiety can begin as early as grade four and increases during middle and high school which can be caused by past classroom experiences, parental influences, and remembering poor past math performance.

Math anxiety can begin as early as grade four and increases during middle and high school which can be caused by past classroom experiences, parental influences, and poor past math performance (Scarpello, 2007). It was apparent, after reviewing the results, that math anxiety, needed math skills, and unsuccessful standardized tests have been a problem for many of the students. Information sharing and collaborative measures are essential, not only in math, but for the entire school in meeting academic goals.

Stress

Results on perceived stress did not show significant differences during the pretest or posttest between groups. The experimental group disclosed emotional feelings about the value-laden topics during the writing intervention which may have attributed to their higher levels of stress during this study. Highly anxious students in stressful situations may be more susceptible to unwanted failure in math despite often showing competency in other areas (Beilock, 2008). This body of research could be used in early detection of student stress through the expressive writing intervention.

Mathematics SOL Results

Results from the end- of-course testing of the math SOL resulted in the experimental expressing writing group scoring at a 52% pass rate, a 48% failure rate with 39% of participants from the failure group falling in the expedited re-take range. The control group had a 49% pass rate, a 51% failure rate with 27% of the participants falling in the expedited re-take range. Participant who scored between 375 and 399 (expedited range) were allowed another opportunity to retest within a week with remediation prior to retaking the SOL's. As students become less anxious about their math performance, they may make less careless mistakes on the various types of computations (Beilock, 2008), their test scores may improve, and they can be better prepared for the future while experiencing more confidence in their approach to learning.

Mathematics' Performance

The experimental and the control group experienced decreases in their mean mathematics scores from pretest to posttest, though not statistically significant. The means varied slightly between the pretest scores between the experimental group and the control group as measured by the Mathematics' Practice Standard of Learning Test. Results indicated the control group had higher mean scores on the Mathematics' Practice Standard of Learning Test than the experimental group during the posttest between groups comparison. The participants in this study were enrolled in the geometry class due to failing the course the previous semester. Some students may have failed the course more than one time indicating poor previous math performance. This body of

research was used to open opportunities for students to experience success in passing the SOL mathematics test through expressive writing.

Mathematical understanding and high school assessments provide adolescents with skills and experiences that pave the way to both college and careers (Brown & Conley, 2007). Students decrease their level of math courses needed due to poor experiences and some due to lack of knowledge of what skills are needed in various careers. This approach should start at elementary school and continue through high school. Shapka, Domene, and Keating (2006), looked at math being a filter in career aspirations and noted that math achievement shaped careers of students from grade nine through their post secondary schooling.

Cognitive Processes

Statistically significant differences were found between Day 1 and Day 3 mean scores within group comparison for both the control and experimental groups on cognitive processes. Smyth et al. (2001) posits that narrative formation and coherence are necessary for expressive writing to be beneficial. Harber and Pennebaker (1992) explain that cognitive processing helps to organize and structure the memory and therefore creates a more adaptive schema related to the traumatic or stressful event. Results from this research could be used in teachers working with students on how in organizing their thoughts for better understanding. Math teachers could have students show their work on a problem, giving partial credit for analyzing their thoughts on paper indicating what went wrong in multi-step math problems.

Statistical significant differences were found within group for the experimental group on psychological processes category in social processes, friends, and humans areas.

Within group results for the control group indicated statistical significance in psychological processes category in social processes, family, affective process, positive emotions, negative emotions and anger. Between groups comparisons revealed the experimental group used more negative words and words expressing anger, anxiety and sadness on both Day 1 and Day 3 than the control group. The control group used more positive words and happy words in their writing with some indication of anxiety than the experimental group. This research could be used in allowing students opportunities to express their feeling through writing which may be beneficial in improving and sustaining student academic and social success. The expressive writing intervention may be one of the first tools needed to assist schools in identifying the individual needs of their students.

The degree to which people express emotions and how they express emotions can tell what they are experiencing (Tausczik & Pennebaker, 2010). During the expressive writing intervention, the experimental group indicated mixed emotions in anxiety, anger and sadness when expressing their thoughts on how they felt about mathematics.

Implications for School Counselors

This study used Expressive Writing as an intervention to reduce anxiety and stress that could be contributing to poor test performance. This should be of particular interest to school counselors as they work towards closing the achievement gap. As a result of this research, counselors could have students' journal their thoughts and discuss with them ways to improve social and academic skills. This can be done as individual counseling and could start at the beginning of school year as counselors try to get to know their students. They could have them write about their best subject and why and maybe at subsequent meeting, students could share information regarding subjects they

struggle with and what could help them. The expressive writing intervention could be implemented in conjunction with SOL preparation, study groups, and groups offering test taking strategies. Counselors could also take data from marking periods and meet with students in small groups and write about why they have grades that are not successful and thoughts about what would be beneficial in helping them.

Approximately one out of every eight students will struggle with anxiety (Wagner, 2005) and the social, emotional, and academic well being of students depend on the involvement and support of the school counselor. Results from this research could be used for school counselor to educate and support school personnel in early identification of students with stress and anxiety and implementation through early interventions. The school counselor can work with school administration to identify various resources and ways to educate staff, parents and other stakeholders on student stress and anxiety during community and in-school staff in-service training. Through collaboration with teachers, administrators, families and community resources, the next generation of school counselors will have acquired the knowledge and skills to work in collaboration with other school stakeholders to meet the academic needs of students (Dahir, 2009). Resources including books, materials on stress and anxiety, as well as results from this study may be used to educate all stakeholders. Young people often imitate their parents' methods of handling stress. Therefore, it is important to consider family dynamics and include the parents when working with students (Matos et al., 2008). School counselors, by communicating with families, can help students examine their expectations and assess the effects that these expectations may have on their level of stress and anxiety.

An integral role of school counselors is to support the school community by assisting school personnel in identifying student's needs and implementing supportive interventions (Hanie & Stanard, 2009). School counselors are in a powerful position to show how they can complement student success through promoting academic rigor (Stone & Dahir, 2006). From the research counselors, within this urban school division, could review the academic profile of each student on their case load. Seniors in a position of not graduating without passing the Virginia Standard of Learning geometry test could benefit from early interventions to support anxiety, stress, or any obstacles impeding their success.

This body of research further adds to the urgency of including and viewing the school counselor as a key person in decreasing anxiety and stress through expressive writing, as a strategy for academic success in schools. School counselors have access to student's grades during each marking period. This data could be used in assisting those failing students. Students in this study experienced levels of stress and anxiety through failing a math course that could impede graduation. School counselors could use the data from this research to help students decreasing levels of stress and anxiety through various types of groups or individual counseling. Results from the expressive writing intervention could be used by counselors during classroom guidance.

Implications for Private Practice or Other Counselors Working with Children and Adolescents

Students may have outside counseling sources to assist them with coping with life challenges. Counselors can work collaboratively with day treatment counselors and in-home counselors dealing with the common issues of ADHD, ODD, behavioral issues, and anger issues as they observe and identify behaviors that may prevent the students

from excelling socially and academically. The treatment of anxiety focuses on identifiable symptoms and behaviors rather than a specific diagnosis. Preventions and treatments can be discussed with health professionals prior to a diagnosis (Wagner, 2005). The expressive writing intervention used in this research could serve as a means to reducing anxiety in students, thus improving their academic performance as well as exhibiting more positive social behaviors.

Expressive writing is a therapeutic exercise which allows individuals an opportunity to write about emotional issues or anything that is blocking progress, i.e. grades, health, personal and social growth. Writing rather than talking about situations often times opens a way for information to flow and improves how we process information. Cognitive Processing – organizing their thoughts: Psychological Processing – how they respond to family, friends, social groups. Emotional cues such as sadness, happiness, and hostility when recognized, could help in supporting progress for clients.

Professional counselors could work with school administrators by strategically planning and establishing groups in improving attendance, academic progress, and behavior. Facilitating parent workshops, as well as faculty workshops could be viewed as growth opportunities for counseling professionals could share while working with children and adolescents. There has to be a team effort between all stakeholders when working with students. As a result of this research, professionals in social work as well as those in private practice could use expressive writing as a source of gaining insight and understanding of how their client's feel. A variety of school related factors are negatively associated with anxiety including poor sleep (Mayers, Grabau, Campbell, &

Baldwin, 2009), school connectiveness (Shochet, Dadds, Ham, & Montague, 2006), and school refusal (McShane, Walter, & Rey, 2001).

Implications for Counselor Educators

University and college professors could share strategies on how to recognize anxiety and stress in students and various ways to use in ways to get to know their students. They could also share various mean of communication when students are reluctant in talking with their school counselor. The expressive writing intervention could serve as one way in which counselors can get to know students and counseling educators could share insight on what to look for when reviewing what student's have written.

Educating future counselors in supporting the needs of students is one step towards supporting the school's goals and visions. Traditional counseling roles are evolving and creativity in meeting the challenges of students is essential as the profession moves forward. University and college professors could provide course work in ways to use data as they support the division goals of academic success for all students. Collaboration with PreK-12 schools is essential in establishing partnerships and being current about the day to day dynamics within schools and encourage expressive writing interventions during practicum and internship experiences. Applying knowledge and theories to the population of students within schools may serve as a practical way to get upcoming school counselors aware of school expectations.

This body of research strived to bring awareness to counseling educations in the hope of strengthening the profession through commitment in widening the opportunity gaps and closing the achievement gaps that are leaving so many students behind. This

starts in knowing their students and meeting the needs of their students in areas outlined in this research.

Implications for Schools

Principals are tasked with serving all students, meeting annual yearly progress (AYP), benchmarks for SOL's, attendance benchmarks, and meeting requirements for on time graduation while creating safe and orderly schools. As students become less anxious about their math performance, they may make fewer careless mistakes on the various types of computations (Beilock, 2008), their test scores may improve, and they can be better prepared for the future while experiencing more confidence in their approach to learning. Schools are being creative in trying to meet these goals; however, new strategies are needed to include all staff and personnel.

In reviewing the writing samples from the expressive writing intervention, students in the experimental group expressed high levels of math anxiety. Teachers could use this research in allowing students an opportunity to express math concerns or any content concerns during the beginning of the school year which could be beneficial for students and teachers. Identifying the problem and discussing strategies together would support decreasing anxiety students may feel. Many students will remain unidentified and unsupported without the involvement of school personnel. Using this research to educate school personnel during staff development or in-service training would better educate personnel on the importance of expressive writing in possibly indicating signs of stress and anxiety among the student body.

Teacher's interaction with students may often lead to developing a rapport with them and thus, teachers may be the first individuals to recognize stress and anxiety in students (Wagner, 2005). Teachers can participate in a school in-service on how to use

and assess the writing activity used in the experimental group during this study. The writing activity may be used in all classes as a pre-assessment of students' thoughts of the academic area being taught. Based on guidelines shared at the in-service teacher may referred to guidance, in a timely manner, names of students who may benefit from group sessions and or other assistance.

The traditional teaching method of asking students to raise their hands is not helpful for a student who never raises his/her hand because he/she would not have the answer. Allowing students to write down their thoughts, without putting their names on their papers, could open the dialogue for what is needed to help students who are not progressing in a content area. Math has to be more than computations; it has to be an arena of investigation in order for students to understand and enjoy mathematics (Newby, 2004). Incorporating pre-and post- writing activities in mathematics may allow students to explore their strengths and address their derailers in the content area.

Many students are experiencing stress and anxiety that may be a result of peer and community pressure. Other school issues such as bullying, low self esteem, socio economic status are some of the challenges students are facing contributing to anxiety, stress and poor academic performance along with community and family issues. Students need to have a forum where they can discuss these challenges and expressive writing could be one way to start the dialogue. Meeting the needs of students should be top priority in preparation for their future. Taking rigorous course work, obtaining high grades, and participating in clubs and activities are element of the holistic growth needed to prepare students to be college, career and citizenship ready will be difficult for some without early interventions.

Implications for Stakeholders

Stakeholders need to be informed and educated on what strategies and interventions are being used in the schools to prepare students for post-secondary education, and the workforce. Partnering with community leaders, establishing mentoring programs, preparing students for community service activities and inviting these services to share their knowledge and experiences with students would assist with educating the whole child as well as help eliminate social barriers that may impede academic success. Exposing students to a plethora of information and professions to address skills needed in various careers should be ongoing and could make a difference in student's life long career choices.

Parents, community leaders, school board members, and legislative representatives could benefit from a student forum noting some of the challenges high school students face as they work towards being successful. This body of research clearly outlined the use of expressive writing in viewing some of the challenges students faced through their anxiety and stress levels, as well as their cognitive and psychological processing through math. As noted earlier, the experiences are not isolated to one content and everyone with a vested interest in shaping this country's future should continue ongoing dialogue to support our students as well as our educational system. Educating our stakeholders with information regarding strategies for academic success, such as expressive writing, will build stronger partnerships and encourage commitment to the various challenges faced by students.

Implications for Future Research

There is a considerable lack of research on test anxiety reduction programs for students including those at the elementary, middle, and secondary levels (Ergene, 2003),

with most of the existing research focusing on college populations. More test anxiety (Wigfield, 1989, Hembree, 1988) and math anxiety (Luzzo, Hasper, Albert, Bibby, & Martinelli, 1999; Furner & Duffy, 2002) interventions are needed to address the development of related anxiety components experienced by students. Future research is needed to see if grades would improve as a result of an expressive writing intervention with a reduction in stress and anxiety. Using other course content in areas where students are not meeting with success could be used use within grade levels. Identifying student's concerns through expressive writing would be instrumental in giving voice to students. This would also allow collaborative effects between families, educators, professional counseling agencies, stakeholders and school educators in partnering for academic and social success for all students. Using expressive writing on higher level math level students in examining their anxiety and stress level as well as their cognitive and psychological processes in comparison to students in lower level math.

Conclusion

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress and mathematics anxiety using a short term intervention. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research was explored on cognitive processes, and psychological processes, analyzing writing samples using the Linguistic Inquiry Word Count (LIWC-2001) software, to see if changes occurred as a result of writing on either a value-laden or neutral topic over three days. An additional area that was explored was to see if there was an effect on the Virginia Standard of Learning (SOL) practice scores for

students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school.

It has become increasingly urgent to find ways to reduce the failure rate on the mathematics Standard of Learning Test, prior to 2014 when No Child Left Behind Act expects a 100% pass rate. Many cognitive interventions have been implemented, such as tutoring, study sessions, and Saturday school. Little attention has been given to addressing the psychological aspects, such as anxiety and stress. This study examined those psychological constructs as related to performance on practice SOL mathematics tests, and investigated the effects of a short term writing intervention on these constructs and on performance. Results from this study resulted in a decrease in anxiety and an increase in the final SOL mathematics' test. The expressive writing analyses indicated the benefits of allowing participants an opportunity to organize their thought process and share information regarding their feelings in areas which could result in academic improvement.

There is a large body of research on the expressive writing paradigm as an intervention with clinical populations. Previous studies on expressive writing have demonstrated its positive effects on health benefits with limited research on adolescents. This study will add to the research of knowledge as well as provide information that can be potentially helpful in understanding the relationship of these variables to academic performance for students.

CHAPTER VI**MANUSCRIPT**

The Effects of Expressive Writing on Cognitive processes, Stress, Anxiety, and
Mathematics Anxiety on the Virginia Standards of Learning (SOL) on a Sample of Urban
High School Students Failing Mathematics

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ABSTRACT

High school students who fail one or more mathematics' classes tend to be more likely to fail the Virginia Standard of Learning (SOL) tests and thus delaying their graduation. The purpose of this study was to examine the effects of expressive writing on general anxiety, math anxiety, stress, cognitive processes and psychological processes on the Virginia Standards of Learning (SOL) on a sample of urban high school students failing mathematics. The participants (n=93) male and female students in grades 9-12, ranged in ages from 14 to 19 years of age, from various socio-economic backgrounds. The intact classes were used to reduce disruption of the instructional process and to encourage teacher cooperation. The experimental group (n=54) wrote on a value latent topic and the control group (n=39) wrote on a neutral topic. When compared to the control group, statistically significant results revealed the experimental group reported lesser levels of anxiety after the writing intervention. Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. During the SOL geometry mathematics test, the experimental group had a 52% pass rate and the control group had a 49% pass rate.

Key words: adolescents; expressive writing; stress; test anxiety; cognitive processes; Virginia Standards of Learning Test

The Effects of Expressive Writing on Cognitive processes, Stress, Anxiety, and Mathematics Anxiety on the Virginia Standards of Learning (SOL) on a Sample of Urban High School Students Failing Mathematics

Mathematical understanding and high school assessments provide adolescents with skills and experiences that pave the way to both college and careers (Brown & Conley, 2007). High stakes circumstances or stressful environments may negatively undermine math performance when monetary and social consequences are linked with poor performance (Beilock, 2008). Virginia supports teaching and learning through statewide system of support and accountability for the commonwealth's public schools and school divisions.

The commonwealth sets rigorous academic standards, known as the Standard of Learning (SOL), which measures achievement through annual SOL tests and alternative and alternate assessments. The system provides schools, school divisions and the Virginia Department of Education with critical data to inform the development and implementation of effective instructional strategies and best practices.

Standard of Learning assessments measure student achievement in English, mathematics, science and history/social science. Students are assessed in English and mathematics in grades 3-8 and at the conclusion of certain high school-level courses. SOL tests in science and history are administered in grades 3, 5 and 8 and at the end of high school-level courses in these subjects.

As public schools prepare students for the 21st century, the goal of the division of this urban high school is to successfully graduate students who are college, career, and citizenship ready. Though challenging, students have an opportunity to achieve their goals by meeting the graduation requirements through a selection of various diplomas.

Students have to pass a minimum of three mathematics' credits in order to obtain a standard diploma with a minimum of four required for the advanced diploma. Students will need to pass a minimum of one mathematic SOL in order to obtain a standard diploma and two mathematics' Virginia Standard of Learning credits to secure an advanced studies diploma. Courses completed to satisfy graduation requirements for students entering ninth grade in 2010 should be at or above the level of algebra and shall include at least three different course section offerings from algebra , geometry, algebra II or other mathematics courses.

The ethnicity breakdown of mathematics' performance on the Standard of Learning Mathematics Test at this urban high school division, scores indicate the following pass rate based on 2009-2010 data. American Indian or Alaskan Native – 60%; Asian -77%, Black (not of Hispanic Origin) 57%, Hispanic – 67%, White (not of Hispanic Origin) – 74%, Unspecified – 60% with an overall performance rate of 63%. Thirty-seven percent of all students fail the mathematics Standard of Learning Test. The State has mandated a 100% pass rate by 2014.

Over the last several decades, researchers have underscored the adverse effect of test anxiety on student performance, apart from the students' previous academic achievement (McDonald, 2001). Hembree's (1988) meta-analysis of 562 studies examining the relationship between test anxiety and academic performance suggested that test anxiety is a significant factor that may inhibit academic performance.

The proposed intervention is expressive writing, where participants write about a value laden or neutral topic for 15 minutes over a period of three days. This intervention will be used to determine if expressive writing can be used to reduce anxiety and

symptoms associated with stress and increase students' overall math performance and performance on the practice SOL mathematics test.

Importance of the Study

It has become increasingly urgent to find ways to reduce the failure rate on the mathematics Standard of Learning Test, prior to 2014 when the No Child Left Behind Act expects a 100% pass rate. Many cognitive interventions have been implemented, such as tutoring, study sessions, and Saturday school. Little attention has been given to addressing the psychological aspects, such as anxiety and stress. This study will examine these psychological constructs as related to performance on practice SOL mathematics tests, and investigate the effects of a short term writing intervention on these constructs and on performance.

There is a large body of research on the expressive writing paradigm as an intervention with clinical populations. Previous studies on Expressive writing have demonstrated its positive effects on health benefits with limited research on adolescents. This study will add to the research of knowledge as well as provide information that can be potentially helpful in understanding the relationship of these variables to the SOL mathematics' performance for this sample of urban high school students.

Background

Description of Division

This public school is a large urban school division in southeastern Virginia with approximately 30,500 students enrolled in its five high schools, eight middle schools, twenty-six elementary schools, five early childhood centers, and four alternative schools. The demographic breakdown shows the following: 51.0% males and 49.0 % females,

55.7% African American, 29.0% Caucasian, 9.9% Hispanic, 0.1% Asian/Pacific Islander, 1.9% Multi-Race, and 0.5% Native American. Other demographic information includes 46.5% of students who qualify for free and reduced meals, 12.5% of students identified as special needs, 8.2% of students identified as talented and gifted, and 1.79% of students in need of English as a second language (City Public Schools, 2010).

Urban High School Mathematics Spring 2010 Performance: Grade and Gender

Geometry pass/fail percentages for female include 21.9% passing and 78.1% failing. Males passed at 31.3% with a failure rate of 68.9%. Ranges for grade levels nine through eleven indicate a pass rate of 75% to 23% for females and 79% to 34% for males. Geometry SOL scores indicate a decline in grade levels for both female and male students. A review of the performance during the spring 2010 Virginia Standards of Learning Mathematics Tests shows that the school has an overall failure rate of 41.1% with an overall passing rate of 58.9% in mathematics.

Urban School Division Mathematics Spring 2010 Performance: Grade and Gender

Geometry pass/fail percentages for females range from 97% to 25% passing and 74% to 3% failing. Males passed at a range of 98% to 27% passing and 74% to 2% failing. Ranges for grade levels ninth through twelfth indicate a pass rate of 75% to 22% for females and 98% to 27% for males. Geometry SOL scores indicate a decline in grade levels for both female and male students. A review of the performance during the spring 2010 Virginia Standards of Learning Mathematics Tests shows that the division has an overall failure rate of 72.3% with an overall passing rate of 27.7% in mathematics grades 8 – 12.

Participants

Intact classes were chosen because it was less disruptive to the learning process. The classes were selected based on previous academic performance in mathematics. Students in this research failed the first semester of geometry and repeated the course during the second semester. The research allowed them to take the second part of the course to complete the full semester requirement. The participants were ($n=93$) male and females in grades 9-12, ranging in ages from 14 to 19 years of age, from various socio-economic backgrounds. Students remained in intact class groups which were designated as either an experimental group or a control group. Both groups participated in the writing intervention.

The researcher originally identified one hundred thirty students to participate in the study at the end of the previous school year. Twenty-five students were excluded from the study at the beginning of the current school year and prior to beginning research after the researcher discovered they successfully completed the course during summer school. Five students chose not to participate in the study. Two students transferred to a different school. Two students withdrew from the course; one student decided to pursue his General Education Diploma (GED) and the other student enrolled in Job Corps. One student was misplaced in the course and was placed into the correct course. A student identified as an English as the Second Language (ESL) participant desired to participate in the study, but she was excluded from the study due to having a language barrier.

The final sample consisted of ninety-three participants, fifty-one females and forty-two males. Participants ranged in age from 14 to 19 ($M=16.56$, $SD=1.03$). Only one participant was classified as a ninth grader, while grade levels 10, 11, and 12 had

better representation in the study, 20 (21.3%), 46 (48.9%), and 27 (28.7%) participants, respectively. The participants' grade point average ranged from 1.11 (D) to 2.93 (B-) ($M = 1.92$, $SD = .41$). Reported ethnicities were as follows: 71 (75.5%) were African-American/Non-Hispanic, 17 (18.1%) were Caucasian/Non-Hispanic, 3 (3.2%) were Hispanic, 1 (1.1%) were Asian, 2 (2.1%) were Multiracial.

Procedure

The researcher received approval from the Old Dominion University's Human Subjects Institutional Review Board, the Newport News Public School System, the school principal and teacher(s) of the course. Written informed consent was requested and obtained from parents and guardians. A description of the study, anticipated risks and benefits, procedures to maintain confidentiality, withdrawal privileges, and a permission form were directly to parents and guardians through the mail. The purpose of the study and its relevance to students was explained. The cooperation and participation of school administrative officials and mathematics teachers was granted. To alleviate potential concerns that the interventions might detract from the teacher's implementation of the mathematics curriculum a meeting with the mathematics teachers was held to provide information about the proposed study.

The researcher, an Old Dominion University doctoral student, collected the data, formulated a research design and conducted the research with the assistance of the mathematics teachers, school counselors, one administrator, and one technical support person. The teachers of the course administered and scored the Practice SOL Test during the pretest and posttest. The school counselors checked to make sure all students who qualified to take the mathematics' course was enrolled in the class. The classroom

teachers were present while the researcher conducted the study. One administrator and one technical support person was trained, by the researcher, to assist in administering the three instruments. The technical support person assisted in setting up a system which allowed all writing samples to be saved on one coded file. The study was supervised by Dr. Nina Brown and Dr. Steve Myran, faculty members at Old Dominion University.

The students were informed that their responses to measures and writings would not be accessible to their classmates, parents, guardians, or teachers. The PILL, MAACL-R, and MARS-A were administered in the classrooms of the intact class groups followed by a writing sample for the experimental group and control group. The researcher and one administrator administered the instruments to the participants before the value-laden short term expressive writing intervention and neutral topic to control group was given. These measures served as a baseline measure of current anxiety, stress and mathematics anxiety.

Data Analyses

Data was analyzed using descriptive statistics. Quantitative analysis was used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Demographic information regarding student's gender, ethnicity, grade level and age was obtained from the division's student data base. Practice mathematics Virginia Standard of Learning Scores was acquired through the geometry teacher's class reports. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative Analysis included content analysis of writing samples obtained from the

experimental and control groups. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC 2001) software.

To examine question one a paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on stress, as assessed by the PILL, for the experimental group and for the control group. A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of stress, as measured by the PILL. A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on stress, as assessed by the PILL, between the experimental group and the control group, on the posttest, using the pretest PILL scores as a covariate.

To examine question two a series of paired samples t tests were conducted to determine if there were differences between the pre test and post test scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, for the experimental group and for the control group. A series of one-way analysis of variances (ANOVAs) were conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of general anxiety, as measured by the MAACL-R subscales (Depression, Anxiety, and Hostility) and composite scores (Positive Affect, Sensation Seeking, Dysphoria, and PASS). A series of analysis of covariances (ANCOVAs) were conducted to determine the difference between the experimental and control groups post test scores on the Depression, Anxiety, Hostility, Positive Affect,

Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, using their respective pre test scores as covariates.

To examine question three a paired samples t-test was conducted to determine if there was a significant difference between the pre test and posttest scores on anxiety, as assessed by the MARS, for the experimental group and for the control group. A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pre-test scores of anxiety, as measured by the MARS. A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on anxiety, as assessed by the MARS, between the experimental group and the control group, on the posttest, using the pretest MARS scores as a covariate.

To examine question four a paired samples t-test was conducted to determine if there was a significant difference between the pre test and posttest scores on the Mathematics' Practice Standard of Learning Test for the experimental group and for the control group. A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on mathematics test scores, as measured by the Mathematics' Practice Standard of Learning Test. A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on mathematics scores, as assessed by the Mathematics' Practice Standard of Learning Test, between the experimental group and the control group, on the posttest, using the pretest Mathematics' Practice Standard of Learning Test scores as a covariate.

To examine question five standard multiple regression was used to assess the contribution of the predictor variables (e.g., group membership, posttest scores on the PILL, MAACL-R, and the MARS-A, and the pre-test scores of the VA Math Practice SOL) on the outcome variable, the posttest scores on the VA Math Practice SOL.

An additional analysis, a one-way between groups MANCOVA, was conducted to investigate the differences between the experimental and control groups on the posttest scores for the VA Math Practice SOL, PILL, MARS-A, and the MAACL-R. Preliminary assumptions' testing was performed to check for normality, linearity, outliers, homogeneity of variance, and multicollinearity; no serious violations were noted.

To examine question six a series of paired samples t tests were conducted to determine if there were significant differences between the experimental group's essay samples Day 1 to Day 3 cognitive processes scores, as assessed by the subcategories, Cognitive Processes, Insight, Causation, Discrepancy, Tentative, Certainty, Inhibition, Inclusive and Exclusive. A series of paired samples t- tests were conducted to determine if there were significant differences between the control group's essay samples Day 1 to Day 3 cognitive processes scores, as assessed by the subcategories, Cognitive Processes, Insight, Causation, Discrepancy, Tentative, Certainty, Inhibition, Inclusive and Exclusive. A series of independent samples t tests were conducted to determine if there were significant differences between the experimental and control group essay samples on Day 1 and Day 3 cognitive processes scores, as assessed by the subcategories, Cognitive Processes, Insight, Causation, Discrepancy, Tentative, Certainty, Inhibition, Inclusive and Exclusive.

To examine question seven a series of paired samples t tests were conducted to determine if there were significant differences between the experimental group's essay samples Day 1 to Day 3 psychological processes, as assessed by the subcategories, Social Processes, Family, Friends, Humans, Affective Processes, Positive emotion, Negative emotion, Anxiety, Anger, and Sadness. A series of paired samples t tests were conducted to determine if there were significant differences between the control group's essay samples Day 1 to Day 3 psychological processes, as assessed by the subcategories, Social Processes, Family, Friends, Humans, Affective Processes, Positive emotion, Negative emotion, Anxiety, Anger, and Sadness. A series of independent samples t tests were conducted to determine if there were significant differences between the experimental and control group essay samples on Day 1 and Day 3 psychological processes, as assessed by the subcategories, Social Processes, Family, Friends, Humans, Affective Processes, Positive emotion, Negative emotion, Anxiety, Anger, and Sadness.

Research Design

The purpose of this mixed method model research design was to see if there would be a reduction in anxiety, stress and mathematics anxiety using quantitative research. Qualitative research was explored on cognitive and psychological processes, analyzing writing samples, to see if there is an improvement in Virginia Standard of Learning (SOL) scores for students who were considered to be at risk because of previous academic achievement in mathematics at an urban high school. There have been several studies demonstrating the benefits of expressive health outcomes; however, of the studies researched, none has explored the effects of expressive writing with adolescents in an academic environment. The expressive writing samples were analyzed and the researcher

conducted a qualitative analysis on the student's writing samples using the LIWC 2001 software to gather information about their cognitive and psychological processes.

The current study proposed a pretest-posttest control group experimental design. There was one experimental group and one control group with a total of ninety-three participants. The experimental group received the expressive writing intervention of writing on three relevant topics over a period of three days. The control group received the expressive writing intervention on three neutral topics over a period of three days. Both groups received pretest and posttest measures. The current study utilized the expressive writing protocol created by Pennebaker and Beall (1986). Both groups received pre and post assessments of general anxiety, mathematics anxiety, and physical symptoms associated with stress and mathematics test scores. Additional pretest data was gathered on demographic information through the student data information system. The experimental and control group wrote for 15 minutes per day for three consecutive days and complete posttest measures. Dimitrov and Rumrill (2003) point out that the most common threats to internal validity with this design are maturation and history. Maturation occurs when biological and psychological characteristics of study participants change during the experiment, thus affecting their posttest scores. History occurs when participants experience an event (external to the experimental treatment) that affects their posttest scores (p. 160). The threat of internal validity due to maturation and history in this study is low due to the short duration of the experiment. This design may have external threats to validity, which include interaction of setting and treatment and reactive interaction effect of pretesting (Dimitrov & Rumrill, 2003). This study will be able to control for the reactive interaction effect of pretesting by using the pretest scores as a

covariate in the data analysis. The external validity threat of setting and treatment cannot be controlled and is therefore, considered a limitation of the study design.

Expressive Writing

Throughout history, writing has had an extreme influence on the feelings, thoughts, and behaviors of individuals and entire societies (Lepore & Smyth, 2006). The relationship between emotional expression and health have arisen because of provocative findings linking “expressive writing” to health (Pennebaker, 19989; Smyth & Pennebaker, 2001). Expressive writing is an intervention where individuals are asked to write about personally upsetting experiences for 15 to 20 minutes each day for several days. In randomizing experiments, the intervention has been found to produce positive effects on diverse aspects of physical and mental health, including reductions in health center visits, self-reported illness, and depressive symptoms and improvements in immune system and role functioning (Smyth, 1998). In numerous studies during the past two decades, this paradigm has produced findings positively associated with increased physical and mental health benefits (Pennebaker, 1997). In another study, Lumley and Provenzano (2003) examined expressive writings effect on academic performance of college students. The writing experiment was for four days. The study participants (n=74) were randomly assigned to an expressive writing condition writing on stress (experiment) or a writing condition on time management (control). Participants rated their mood before and after writing each day of the study. The results of the study indicated that the experimental writing condition led to improved grade point averages in subsequent semesters and improved mood.

Purpose

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress and mathematics anxiety using a short term intervention. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research was explored on cognitive processes, and psychological processes, analyzing writing samples using the Linguistic Inquiry Word Count (LIWC-2001) software, to see if changes occurred as a result of writing on either a value-laden or neutral topic over three days. An additional area that was explored was to see if there was an effect on the Virginia Standard of Learning (SOL) practice scores for students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school.

Rationale

The researcher's aim was to see if stress, general anxiety and math anxiety are reduced, would there will be an improvement in Standard of Learning mathematics practice scores for students who fail mathematics at one urban high school. There have been several studies demonstrating the benefits of expressive writing with positive health outcomes; however, of the studies researched, none have explored the effects of expressive writing with adolescents in an academic environment.

Theoretical Foundation

The Expressive Writing Paradigm

Expressive writing is a brief writing intervention that has shown positive outcomes on a variety of subjects for a variety of conditions. For example, significant

benefits have been found for students' grade point averages (Pennebaker & Francis, 1996; Cameron & Nicholls, 1998; Cohen et al. 2006, and Wilson, 2006); working memory (Klein & Boals, 2001); self-reported health outcomes. (Cameron & Nicholls, 1998; Park & Blumberg, 2002); and medical conditions (Symth 1998; Rosenberg et. al. 2002). Most research has involved subjects writing about traumatic, stressful or emotional events for 15-20 minutes (the maximum) over 3-5 days. In contrast, the studies by Wilson (2006) and Cohen et al. (2006) used self-affirmations for writing. In this study, the researcher will see if a brief writing intervention will improve Virginia Standard of Learning Scores (SOL) for students who have failed mathematics at one urban high school. The experimental and control group wrote over a period of three days for 15 minutes in intact classes.

The Basic Writing Paradigm (Pennebaker, 1997) involves randomly assigning each participant to one of two or more groups. Each group is tasked with writing for 15 to 30 minutes each consecutive day about an assigned topic. Participants assigned to the control group write about emotional or neutral topics. Typically, participants in a disclosure group write about thoughts and feelings connected to a stressful occurrence (Lepore & Smyth, 2002). Groups are compared on changes in well-being from baseline to follow-up, which is most commonly within several months of writing.

Overview of the Study

The study used a mixed model research design. This study provided data about the effects of expressive writing on cognitive processes, stress, general anxiety, and mathematics anxiety on the Virginia Standards of Learning (SOL) mathematics practice test on a sample of urban high school students failing mathematics. The purpose of this

study was to determine if either or both experimental interventions effectively reduced the anxiety and improved test performance. Students remained in intact class groups with an experimental group and a control group for a total of 93 participants ($n=93$). To detect a medium difference between two independent means at $\alpha = .05$ requires $n = 64$ in each group for power analysis. The participant count originally started with 130 participants and decreased to 93 based on various changes within the student's schedule.

Approximately twenty-five students completed the course in summer school, one student withdrew to pursue a General Education Diploma (GED), one student pursued the job corps as an option, one student was misplaced in the class, two students transferred to another school, and one student experienced a language barrier as an English as the Secondary Language (ESL) student and six students chose not to participate.

The experimental group received the expressive writing intervention of writing on a value-laden topic and the control group wrote on a neutral topic as part of their expressive writing exercise. Both groups received pretest and posttest measures. The current study utilized the expressive writing protocol created by Pennebaker and Beall (1986). Both groups received pretest and posttest assessment of anxiety, mathematics anxiety, and stress associated with mathematics test scores. Additional pretest data was gathered on demographic information through the student data information system. Both the experimental and control group wrote over a period of three days for 15 minutes each day.

Data gathering instruments were the Pennebaker Inventory of Limbic Languidness (PILL), the Math Anxiety Rating scale (MARS), the Multiple Affect

Adjective Checklist-Revised (MAACL), and the writing essays using the Linguistic Inquiry Word Count software (LIWC-2001).

The Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1980) measured the frequency of general physical symptoms and sensations associated with stress are experienced. The PILL is a 54 item instrument with a five point scale designed to evaluate the frequency of general physical symptoms. The PILL, used in this study, was modified by using Pennebaker's Symptom/Emotion Checklist: A State Measure to select symptoms which were common to both the checklist and the inventory and related to an adolescent population. The modified symptom inventory consisted of 20 items. High scores reflect the higher amounts of physical symptoms associated with stress and anxiety.

The Math Anxiety Rating Scale (MARS) was developed by Suinn to provide a unidimensional measure of anxiety related to number operations and other mathematical concepts (Suinn, Edie, Nicoletti, & Spinelli, 1972). Subjects indicated the degree of anxiety produced in response to situational items by indicating a range from one to five. Total scores reflected the sum of item values. High scores reflect high anxiety associated with mathematics. Normative information for secondary high schools was obtained (Suinn & Edwards, 1982) with 197.6 being the mean MARS-A score.

Released test for the practice Standard of Learning Mathematics' Test was used which is a sample set of Standards of Learning (SOL) tests administered to Virginia public school students during the previous spring test administration released by the Virginia Department of Education. The released tests are not inclusive of all Standard of

Learning tests administered during the previous year; however, the tests are representative of the content and skills assessed.

The Multiple Affect Adjective Checklist-Revised (MAACL-R), developed by Lubin and Zuckerman (1999) measured affective states and traits. The instrument incorporates three basic scales: Anxiety, Depression, and Hostility. The checklist was a form with 132 adjectives to measure the major scales and the sub-scales of Positive Affect and Attention Seeking. Designed for use with college students as a measure of test anxiety, the instrument has also been used with high school populations. Raw scores for each subscale and each composite score were converted into t-score, using the corresponding table in the Appendix of the MAACL-R manual.

Qualitative Analysis included content analysis of writing samples obtained from the experimental and control groups. The essays were analyzed using the Linguistic Inquiry Word Count (LIWC-2001), available for computer scoring. The LIWC-2001 Dictionary was composed of 2,290 words and word stems. Each word or word-stem defined one or more word categories or sub dictionaries. For example, the word 'cried' is part of four word categories: sadness, negative emotion, overall affect, and a past tense verb. Hence, if it is found in the target text, each of these four sub dictionary scale scores will be incremented. As in this example, many of the LIWC-2001 categories are arranged hierarchically. All anger words, by definition, will be categorized as negative emotion and as overall emotion words. Each of the 74 preset LIWC-2001 categories is composed of a list of dictionary words that define that scale (Pennebaker, Francis, Booth, 2001).

Findings and Conclusions

This study explored seven research questions. The results of the detailed statistical analysis of those seven questions are examined in this section. The analytical procedure for each question is presented in this section and the results of the analysis upon the individual hypothesis formulated for each question were presented in the following section.

Research Question One

Research question one stated “What is the effect of expressive writing on stress in a sample of urban high school students?”

Findings:

Experimental Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on stress, as assessed by the PILL, for the experimental group. The results indicated that there was no statistically significant difference between the pre test ($M = 8.3$, $SD = 4.4$) and post test ($M = 8.9$, $SD = 4.9$) scores for the experimental group, $t = .97$, $p > .05$ (two-tailed). According to the empirical rule, about 68% of the participants in the experimental group indicated a score range in responses from 3.9 to 12.7 on the pretest and 4.0 to 13.8 during the posttest on stress. The means varied slightly between the pretest and posttest scores on stress as measured by the PILL, but were not statistically significant. The null hypothesis was not rejected.

Control Group

A paired samples t -test was conducted to determine if there was a significant difference between the pretest and posttest scores on stress, as assessed by the PILL, for

the control group. The results indicated that there was no statistically significant difference between the pretest ($M=7.1$, $SD = 4.4$) and posttest ($M =6.9$, $SD = 4.8$) scores for the control group, $t = .2$, $p>.05$ (two-tailed). Participants in the control group indicated a score range in responses from 2.7 to 11.5 on the pretest and 2.1 to 11.7 on the posttest. The means varied slightly between the pretest and posttest scores on stress as measured by the PILL, but were not statistically significant. The null hypothesis was not rejected.

Between Groups

A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of stress, as measured by the PILL. The results indicated that there was no statistically significant difference between the two groups, $F(1, 93) = 1.8$, $p>.05$. The null hypothesis was not rejected.

Between Groups

A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on stress, as assessed by the PILL, between the experimental group and the control group, on the posttest, using the pretest PILL scores as a covariate. The results indicated that there was no statistically significant difference in post PILL scores between the experimental group and control group, $F(1, 93) = 3.5$, $p>.05$ partial eta squared = .04. However, there was a 2.0 difference between the experimental group ($M=8.9$, $SD = 4.9$) and the control group's mean stress scores ($M= 6.9$, $SD = 4.8$) on the posttest. The null hypothesis was not rejected.

Conclusion

The writing intervention did not have a significant effect on measured stress.

Research Question Two

Research question two stated “What is the effect of expressive writing on general anxiety in a sample of urban high school students?”

Finding:

Experimental Group

A series of paired samples t tests were conducted to determine if there were differences between the pretest and posttest scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, for the experimental group. Results revealed that there were statistically significant differences between the pretest and posttest for the Depression ($t=2.91$, $p<.001$ (two-tailed), Anxiety ($t=3.73$, $p<.001$ (two-tailed), Hostility ($t=3.94$, $p<.001$ (two-tailed), and the Dysphoria composite score ($t=4.52$, $p<.001$ (two-tailed). Pretest score on the Depression subscale ($M = 52.3$, $SD = 10.1$), posttest score ($M = 46.7$, $SD = 8.5$), pretest score on the Anxiety subscale ($M = 52.3$, $SD = 10.3$), posttest score ($M = 45.5$, $SD = 8.9$), pretest score on the Hostility subscale ($M = 52.8$, $SD = 8.9$), posttest score ($M = 47.3$, $SD = 8.7$), and the pretest score on the Dysphoria composite score ($M = 53.4$, $SD = 8.7$), posttest score ($M = 46.3$, $SD = 8.5$). No significant differences between the pretest and posttest were found for the Positive Affect ($t = -1.88$, $p>.05$ (two-tailed), Sensation Seeking ($t = .79$, $p> .05$ (two-tailed) , and PASS composite scores ($t = -1.80$, $p> .05$ (two-tailed) pretest score on the Positive Affect composite score ($M = 42.8$, $SD = 10.9$), posttest score ($M = 46.5$, $SD = 11.9$), pretest score on the

Sensation Seeking composite score ($M = 59.2$, $SD = 14.1$), posttest score ($M = 56.6$, $SD = 18.9$), and pretest score on the PASS composite score ($M = 49.8$, $SD = 10.8$), posttest score ($M = 53.4$, $SD = 12.4$). Although all scales and sub-scales did not show significant differences, the null hypothesis was rejected as there was a significant reduction in anxiety.

Control Group

A series of paired samples t tests were conducted to determine if there were differences between the pre test and post test scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, for the control group. Results revealed that there was a statistically significant difference between the pretest and posttest found for the Hostility subscale, ($t = 1.5$, $p < .05$ (two-tailed). Pretest score on the Hostility subscale ($M = 50.0$, $SD = 7.9$), posttest score ($M = 47.6$, $SD = 9.0$). No significant differences between the pretest and posttest were found for the Depression ($t = 1.0$, $p > .05$ (two-tailed), Anxiety ($t = -1.2$, $p > .05$ (two-tailed), Positive Affect ($t = -.93$, $p > .05$ (two-tailed), Sensation Seeking ($t = .98$, $p > .05$ (two-tailed), Dysphoria ($t = .65$, $p > .05$ (two-tailed), and PASS composite scores ($t = -1.22$, $p > .05$ (two-tailed). Pretest score on the Depression subscale ($M = 48.2$, $SD = 7.2$), posttest score ($M = 46.6$, $SD = 8.8$), pretest score on the Anxiety subscale ($M = 47.4$, $SD = 7.5$), posttest score ($M = 49.8$, $SD = 12.2$), pretest score on the Positive Affect composite score ($M = 44.1$, $SD = 11.3$), posttest score ($M = 46.0$, $SD = 10.6$), pretest score on the Sensation Seeking composite score ($M = 57.6$, $SD = 16.0$), posttest score ($M = 54.3$, $SD = 21.7$), pretest score on the Dysphoria composite score ($M = 48.3$, $SD = 7.1$), posttest score ($M = 47.3$, $SD = 9.1$),

and pretest score on the PASS composite score ($M = 51.7$, $SD = 14.0$), posttest score ($M = 54.6$, $SD = 12.4$). The null hypothesis was not rejected.

Pretest Between Groups

A series of one-way analysis of variances (ANOVAs) were conducted to determine if there was a significant difference between the experimental group and the control group on pre-test scores of general anxiety, as measured by the MAACL-R subscales (Depression, Anxiety, and Hostility) and composite scores (Positive Affect, Sensation Seeking, Dysphoria, and PASS). Results revealed statistically significant pretest differences between the experimental group and control groups on the subscale Depression [$F(1, 93) = 4.9$, $p < .05$, partial eta squared = .00], the subscale Anxiety [$F(1, 93) = 6.4$, $p < .05$, partial eta squared = .06], and the composite score Dysphoria [$F(1, 93) = 9.2$, $p < .05$, partial eta squared = .09]. The results indicated that there was no statistically significant difference between the experimental and control groups on pretest results of Hostility [$F(1, 93) = 2.4$, $p > .05$, partial eta squared = .02], Positive Affect [$F(1, 93) = .22$, $p > .05$, partial eta squared = .00], Sensation Seeking [$F(1, 93) = .27$, $p > .05$, partial eta squared = .00], and PASS [$F(1, 93) = .44$, $p > .05$, partial eta squared = .00]. The null hypothesis was rejected for comparisons on anxiety for the experimental and control groups.

Posttest Between Groups

A series of analysis of covariances (ANCOVAs) were conducted to determine the difference between the experimental and control groups post test scores on the Depression, Anxiety, Hostility, Positive Affect, Sensation Seeking, Dysphoria, and PASS subscales and composite scores of the MAACL-R, using their respective pre test scores

as covariates. Differences between the experimental and control group post test results reached statistical significance for the Anxiety subscale [$F(1, 93) = 3.8$, $p = .05$, partial eta squared = .04]. Results revealed there were no statistically significant differences found between the experimental and control groups post test results on the subscale Depression [$F(1, 93) = .00$, $p > .05$, partial eta squared = .00], the subscale Hostility [$F(1, 93) = .02$, $p > .05$, partial eta squared = .00], the composite score Positive Affect [$F(1, 93) = .10$, $p > .05$, partial eta squared = .00], the composite score Sensation Seeking [$F(1, 93) = .22$, $p > .05$, partial eta squared = .00], the composite score Dysphoria [$F(1, 93) = 1.08$, $p > .05$, partial eta squared = .01], and the composite score PASS [$F(1, 93) = .05$, $p > .05$, partial eta squared = .00]. The null hypothesis was rejected for anxiety.

Conclusion

The expressive writing intervention appeared to be effective as evidenced by statistically significant results indicating the experimental group reported decreased levels of depression, anxiety, hostility, and dysphoria from pre-test to post test. When compared to the control group and controlling for pre-test scores, statistically significant results revealed the experimental group reported lesser levels of anxiety. Additionally, the experimental group indicated higher levels in depression, sensation seeking, and positive affect with lower levels of hostility, dysphoria and PASS when compared to the control group. The control group indicated higher levels in hostility dysphoria, and PASS and lower levels in positive affect, depression and sensation seeking than the experimental group, though not statistically significant.

Research Question Three

Research question three stated “What is the effect of expressive writing on mathematics anxiety in a sample of urban high school students?”

Finding:

Pretest-Posttest Experimental Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on math anxiety, as assessed by the MARS, for the experimental group. The results indicated that there was a statistically significant difference between the pretest ($M = 232.7$, $SD = 74.5$) and posttest ($M = 218.8$, $SD = 77.7$) scores for the experimental group, $t = 2.03$, $p < .05$ (two-tailed). There was a decrease of 13.9 in the mean scores for math anxiety, from pretest to posttest. The null hypothesis was rejected.

Pretest-Posttest Control Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on math anxiety, as assessed by the MARS, for the control group. The results indicated that there was no statistically significant difference between the pretest ($M = 209.3$, $SD = 71.9$) and posttest ($M = 196.8$, $SD = 71.6$) scores for the control group, $t = 1.4$, $p > .05$ (two-tailed). However, there was a 12.5 decrease in the mean scores on math anxiety, from pretest to posttest. There was a wide range of dispersment in scores on the math anxiety scores ranging from 137.4 to 281.2 between the pretest and posttest scores, as assessed by the MARS, for the control group. The null hypothesis was not rejected.

Pretest Between Groups

A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest scores of math anxiety, as measured by the MARS. The results indicated that there was no statistically significant difference between the two groups, $F(1, 93) = 2.3$, $p > .05$. However, results revealed that the experimental group reported more math anxiety as evidenced by them having a higher mean math anxiety score ($M = 232.7$, $SD = 74.5$) than the control group ($M = 209.3$, $SD = 71.9$). Math anxiety scores for the experimental group ranged from 158.2 to 307.2 and for the control group 137.4 to 281.2 as assessed by the MARS between groups on the pretest. The means varied between the pretest scores between the experimental group and the control group but were not statistically significant. The null hypothesis was not rejected.

Posttest Between Groups

A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on anxiety, as assessed by the MARS, between the experimental group and the control group, on the posttest, using the pretest MARS scores as a covariate. The results indicated that there was no statistically significant difference in post MARS scores between the experimental group ($M = 218.8$, $SD = 77.7$) and control group ($M = 196.8$, $SD = 71.6$), $F(1, 93) = 1.9$, $p > .05$, partial eta squared = .02. However, there was a 22 point difference between the experimental group and the control group's mean anxiety scores on the post test. Math anxiety scores for the experimental group ranged from 141.1 to 296.5 and for the control group 125.2 to 268.4 between groups on

the posttest as assessed by the MARS. There was a significant dispersement in ranges but they were not statistically significant. The null hypothesis was not rejected.

Conclusion

Results concerning the expressive writing intervention's effectiveness in decreasing math anxiety in this sample appeared to be mixed. There were no statistically significant differences found between the experimental and control groups pre-intervention. The expressive writing intervention appeared to be effective in reducing math anxiety as evidenced by the experimental group reporting statistically significant decreased levels of math anxiety, pretest to posttest. When comparing the experimental group to the control group and controlling for pretest scores, no statistically significant difference was found.

Research Question Four

Research question four stated "What is the effect of expressive writing on mathematics test scores in a sample of urban high school students?"

Finding:

Experimental Group

A paired samples t-test was conducted to determine if there was a significant difference between the pretest and posttest scores on the Mathematics' Practice Standard of Learning Test for the experimental group. The results indicated that there was no statistically significant difference between the pretest and posttest scores for the experimental group, $t = .85$, $p > .05$. Mean scores on the Mathematics' Practice Standard of Learning Test decreased by 4.5 points pre test ($M = 50.3$, $SD = 18.7$) to post test ($M = 45.8$, $SD = 13.3$). Participants' scores ranged from 31.6 to 69.0 on the pretest and 32.5 to

59.1 on the posttest for the experimental group as assessed by the Mathematics' Practice Standard of Learning Test. The means varied slightly between the pretest and posttest scores on math scores as measured by the Mathematics' Practice Standard of Learning Test but were not statistically significant. The null hypothesis was not rejected.

Control Group

A paired samples t -test was conducted to determine if there was a significant difference between the pretest and posttest mathematics scores, as assessed by the Mathematics' Practice Standard of Learning Test, for the control group. The results indicated that there was no statistically significant difference between the pre test and post test scores for the control group, $t = .85$, $p > .05$. Mean scores on the Mathematics' Practice Standard of Learning Test decreased by 7.7 points from pre test ($M = 55.1$, $SD = 17.4$) to posttest ($M = 47.4$, $SD = 15.1$). Participants' scores ranged from 37.7 to 72.5 on the pretest and 32.3 to 62.5 on the posttest for the control group as assessed by the Mathematics' Practice Standard of Learning Test. The means decreased slightly between the pretest and posttest math scores as measured by the Mathematics' Practice Standard of Learning Test but were not statistically significant. The null hypothesis was rejected.

Pretest Between Groups

A one-way analysis of variance (ANOVA) was conducted to determine if there was a significant difference between the experimental group and the control group on pretest mathematics test scores, as measured by the Mathematics' Practice Standard of Learning Test. The results indicated that there was no statistically significant difference between the experimental group ($M = 50.3$, $SD = 18.7$) and the control group ($M = 55.1$,

SD = 17.4), $F(1, 93) = 1.4$, $p > .05$. However, results revealed that the control group scored higher on the Mathematics' Practice Standard of Learning Test than the experimental group. The means varied slightly between the pretest scores between the experimental group and the control group on pretest math scores, as measured by the Mathematics' Practice Standard of Learning Test, but were not statistically significant. The null hypothesis was not rejected.

Posttest Between Groups

A one-way analysis of covariance (ANCOVA) was conducted to compare the effect of expressive writing on mathematics scores, as assessed by the Mathematics' Practice Standard of Learning Test, between the experimental group and the control group, on the posttest, using the pretest Mathematics' Practice Standard of Learning Test scores as a covariate. The results indicated that there was no statistically significant difference in post Mathematics' Practice Standard of Learning Test scores between the experimental group ($M = 45.8$, $SD = 13.3$), and control group ($M = 47.4$, $SD = 15.1$), $F(1, 93) = .24$, $p > .05$, partial eta squared = .00. Further examination of the results revealed the control group scored higher on the Mathematics' Practice Standard of Learning Test at post test than the experimental group, when controlling for pretest scores. The means varied slightly between the posttest scores between the experimental group and the control group on math scores with the control group scoring higher, as measured by the Mathematics' Practice Standard of Learning Test, but were not statistically significant. The null hypothesis was not rejected.

Conclusion

The expressive writing intervention did not appear to be effective in increasing mathematics scores in this study. There were no statistical significant differences found between the experimental and control groups pre-intervention. Following the implementation of the expressive writing intervention, the experimental group and the control group did not report statistically significant differences in their mathematics scores. However, both groups experienced decreases in their mathematics scores from pretest to posttest, though not statistically significant. When comparing the experimental group to the control group and controlling for pretest scores, no statistically significant difference was found; yet the control group had higher mean mathematics scores than the experimental group.

Research Question Five

Research question five stated “What is the relationship between the predictor variables, group membership (experimental and control) stress, general anxiety, math anxiety, and previous mathematics performance on the outcome variable, mathematics test scores, in a sample of urban high school students?”

Finding:

Standard multiple regression was used to assess the contribution of the predictor variables (e.g., group membership, posttest scores on the PILL, MAACL-R, and the MARS-A, and the pre-test scores of the VA Math Practice SOL) on the outcome variable, the posttest scores on the VA Math Practice SOL. The regression model was not statistically significant, $F(5, 67) = 1.82, p > .05$; adjusted R square = .054. When evaluating the predictor variables individually, the pretest scores on the VA Math

Practice SOL made a significant and unique contribution to explaining the outcome variable, November VA Math Practice SOL, when the variance explained by all the other predictor variables are controlled ($\beta = .28, p < .02$).

Additional Analysis

An additional analysis, a one-way between groups MANCOVA, was conducted to investigate the differences between the experimental and control groups on the posttest scores for the VA Math Practice SOL, PILL, MARS-A, and the MAACL-R. Preliminary assumptions' testing was performed to check for normality, linearity, outliers, homogeneity of variance, and multicollinearity; no serious violations were noted.

Finding:

Between Groups

There were no statistically significant differences found between the experimental and control groups on the combined dependent variables, $F(4, 70) = .18, p < .95$; Wilks' Lambda = .99; partial eta squared < .01. The experimental group had higher means on the PILL ($M = 8.78, SD = 4.9$), MARS-A ($M = 223.20, SD = 79.1$), than the control group ($M = 6.67, SD = 4.1$), ($M = 194.82, SD = 72.5$). Ancillary analyses revealed no statistically significant differences between the experimental group and control group when collectively considering posttest mathematics scores, anxiety scores, general anxiety scores, and mathematics anxiety scores.

Conclusion

Regardless of whether the participants were in the experimental or control group and their levels of stress, general and mathematics anxiety, only previous mathematics performance appeared to contribute to the participants' later mathematics performance.

Results indicate the better previous mathematics performance is the better later mathematics performance will be. In this study, expressive writing did not appear to be an effective intervention in improving mathematics performance although other studies have shown gains in academic achievement with its implementation.

Research Question Six

Research question six stated “Is there a significant difference within group comparison for the experimental group in the cognitive processes category in a sample of urban high school students’ expressive writing samples?”

Finding:

Cognitive Processes

Experimental Group

A series of paired samples t tests were conducted to determine if there were significant differences between the experimental groups mean scores Day 1 to Day 3 on cognitive processes scores. Results revealed that there was a statically significant difference between Day 1 and Day 3 mean scores essays for the essays for the Insight subcategory, $t = -3.4, p < .001$, (two-tailed). Differences between mean scores on Day 1 and Day 3 essays for the Cognitive processes subcategory reached statistical significance, $t = -2.0, p = .05$, (two-tailed).

No significant differences between Day 1 and Day 3 essays were found for other measured cognitive processes.

Control Group

A series of paired samples t- tests were conducted to determine if there were significant differences between the control groups mean scores on Day 1 to Day 3

cognitive processes scores. Statistically significant differences were found between Day 1 and Day 3 mean scores on Cognitive Processes, $t = -2.3$, $p < .05$ (two-tailed); Insight $t = -3.7$, $p < .001$ (two-tailed); and Causation, $t = 2.5$, $p < .05$ (two-tailed).

No significant differences between Day 1 and Day 3 essays were found for other measured processes.

Between Groups

A series of independent samples t -tests were conducted to determine if there were significant differences between the experimental and control group's mean scores on Day 1 and Day 3 on cognitive processes scores. For Day 1, statistically significant differences between the experimental group and the control group were found for the subcategories Cognitive Processes, $t = -2.7$, $p < .05$ (two-tailed); Insight ($t = -4.7$, $p < .05$ (two-tailed), Tentative, $t = -2.8$, $p < .05$ (two-tailed); Inclusive, $t = 2.0$, $p < .05$ (two-tailed) and Exclusive, $t = -3.6$, $p < .05$ (two-tailed). For Day 3, statistically significant differences between the experimental and control groups were found for subcategories Insight, $t = 2.7$, $p < .05$ (two-tailed); Inclusive, $t = 2.4$, $p < .05$ (two-tailed) and Exclusive, $t = -3.0$, $p < .05$ (two-tailed). Of the statistically significant differences, the experimental group reported higher levels for all the subcategories except for the Inclusive subcategory.

Conclusion

The experimental group was able to process and express their thoughts in areas of discussion with words reflecting organizing their thought patterns as they were writing on how they felt about math. They used words indicating what they knew and considered possibilities as evidenced by their use of exclusive words and their feelings about a subject in which the performance for them was low. The control group used more words

connecting and giving examples as evident of their use of inclusive words as they wrote about their plans after high school.

Research Question Seven

Research question seven stated “Is there a significant difference within group comparison for the experimental group in the psychological processes category in a sample of urban high school students’ expressive writing samples?”

Finding:

Psychological Processes

Experimental Group

A series of paired samples t- tests were conducted to determine if there were significant differences between the experimental groups mean scores Day 1 to Day 3 on psychological processes. Statistically significant differences between Day 1 and Day 3 mean scores were found for Social Processes, $t = 3.5$, $p < .05$ (two-tailed); Friends, $t = 2.5$, $p < .05$, (two-tailed); and Humans, $t = 4.0$, $p < .05$ (two-tailed).

No significant differences between Day 1 and Day 3 mean scores were found for other psychological processes.

Control Group

A series of paired samples t tests were conducted to determine if there were significant differences between the control groups mean scores Day 1 to Day 3 for psychological processes. Statistically significant differences between Day 1 and Day 3 mean scores were found for Social Processes, $t = -4.7$, $p < .05$ (two-tailed); Family, $t = 2.4$, $p < .05$, (two-tailed); Affective Processes, $t = -2.9$, $p < .05$, (two-tailed); Negative Emotions, $t = -3.3$, $p < .05$ (two-tailed); and Anger, $t = -3.1$, $p < .05$ (two-tailed).

Differences between Day 1 for the Positive Emotions subcategory reached statistical significance, $t = -2.0$, $p = .05$, (two-tailed).

No significant differences between Day 1 and Day 3 mean scores on other psychological processes were found.

Between Groups

A series of independent samples t -tests were conducted to determine if there were significant differences between the experimental and control group mean scores on Day 1 and Day 3 psychological processes. For Day 1, statistically significant differences between the experimental group and the control group were found for the subcategories Negative Emotions, $t = -6.4$, $p < .05$ (two-tailed); Anxiety, $t = -2.3$, $p < .05$ (two-tailed); Anger, $t = -3.6$, $p < .05$ (two-tailed) and Sadness, $t = -2.5$, $p < .05$ (two-tailed). The experimental group scored higher in all categories. For Day 3, statistically significant differences between the experimental and control groups were found for subcategories Social Processes, $t = 5.7$, $p < .05$ (two-tailed); Affective Processes, $t = 2.7$, $p < .05$ (two-tailed); Positive Emotion, $t = 4.7$, $p < .05$ (two-tailed); Negative Emotion, $t = -3.0$, $p < .05$ (two-tailed); Anxiety, $t = -2.4$, $p < .05$ (two-tailed) and Sadness, $t = -3.5$, $p < .05$ (two-tailed).

Conclusion

The experimental group used more negative words and words expressing anger, anxiety and sadness on both day one and day three. Day one asked about their feelings about mathematics and day three asked about their feelings about school. The control group used more positive words and happy words in their writing with some indication of anxiety. Their topic for day three was on their favorite time of the year.

Summary of Findings

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress, mathematics anxiety, cognitive processes and psychological using a short term writing intervention. Results of this study indicate that a decrease in stress, and anxiety could result in increased academic performance. Allowing students an opportunity to express their cognitive and psychological thoughts allows teachers an opportunity to assess student's needs. A brief summary of each of these areas noted below, explains the results from each topic.

Stress: The experimental group disclosed emotional feelings about the value-laden topics during the writing intervention which may have attributed to the experimental group's higher levels of stress during this study. Although the stress level of the experimental group did not increase much, it was evident when reviewing their emotional responses on the expressive writing intervention. Participants in the control group reported decreased levels of stress from pretest to posttest. The control group wrote about neutral topics which did not provoke emotional feelings. Results indicate there is a level of stress experienced by students and this study will serve as an area to be considered when working with adolescents.

General Anxiety: The expressive writing intervention was effective as evidenced by statistically significant results indicating that the experimental group reported decreased levels of anxiety. In addition, the scales measuring depression, anxiety, hostility, and dysphoria also decreased from pretest to posttest. When compared to the control group and controlling for pretest scores, statistically significant results revealed the experimental group reported lesser levels of anxiety after the writing intervention.

Math Anxiety: Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. The expressive writing appeared to be therapeutic for both groups whether they wrote on a value-laden topic or a neutral topic.

Practice Mathematics Virginia Standards of Learning: Students enrolled in a geometry class must take the Virginia Standards of Learning Test at the end of the course. Participants in this study took the practice SOL mathematics test which was a group of questions, put together by the mathematics' department, from the State department release tests items from previous geometry SOLs. Passing benchmark scores range between 62% - 100%, middle scores range between 51% - 61%, and failing scores range between 0% - 50%. Prior to the expressive writing intervention, participants in the experimental group had a 24% pass rate, with 28% falling in the middle range and 48% falling below the benchmark. After the expressive writing intervention the experimental group had a 12% pass rate, with 31% falling in the middle range and 57% falling below the benchmark. Prior to the expressive writing intervention participants in the control group had a 38% pass rate, with 31% falling in the middle range and 31% falling below the benchmark. After the writing intervention, the control group has a 19% pass rate, with 22% falling in the middle range and 59% falling below the benchmark. Both groups showed a decrease in the pass rate, and an increase in the below the benchmark rate.

Scale scores on the SOLs are 500-600 for pass/advanced, 400-500 for pass/proficient, and 0-399 for failing score. In high school, students scoring in the expedited category ranging between 375 and 399, are allowed to re-test during the same testing window to increase chances for passing. During the SOL Test, the expressive

writing group had a 52% pass rate, 48% failure rate with 39% of participants from the failure group falling in the expedited re-take range. The control group had a 49% pass rate, 51% failure rate with 27% falling in the expedited re-take range. Overall the school had a 49% pass rate in geometry during the January 2010 testing cycle and a 47% pass rate during the January 2011 testing cycle indicating a slight decrease in comparison of overall mid-year scores.

Cognitive Processes: The experimental group was able to process their thoughts in areas of written expression, organizing their thought patterns as they were writing on how they felt about math. They used words indicating what they knew and considered possibilities as evidenced by their use of exclusive words regarding their feelings about a subject where the assessment resulting in low math performance. The control group used more words connecting and giving examples evident by their use of inclusive words as they wrote about their plans after high school.

Psychological Processes: The experimental group used more negative words and words expressing anger, anxiety and sadness on both day one and day three. Day one asked about their feelings about mathematics and day three asked about their feelings about school. The control group used more positive words and happy words in their writing with some indication of anxiety. Their topic for day three was on their favorite time of the year, a neutral topic, allowing them to express positive thoughts on something they enjoyed.

Limitations of the Study

The timeframe for the intervention was a limitation due to school activities which included grade level assemblies, field trips, homecoming activities, marking period

review, and students out for teacher work day grading period. Individual results were not analyzed during this study. With the exception of one intact class, the alternate schedule did not allow researcher an opportunity to administer the writing intervention for three consecutive days as noted in the original expressive writing protocol by Pennebaker and Beal (1986).

Additional limitations included awaiting the division's approval after seeking approval from the IRB at Old Dominion University. This resulted in a delay in starting the research. Due the late start of the research, the researcher had to work around the school's schedule. Student attendance was a factor which did not allow administering of instruments to all students when scheduled. Researcher sent for students during other class periods and held small groups after school. Permission forms were not returned resulting in frequent reminders, telephone calls to parents, pulling students from other classes, and soliciting support from school counselors.

An additional limitation that may have influenced the outcomes is that the students received additional support services after the writing samples from the experimental group regarding their feelings about mathematics were read. Both the experimental and control groups received the services. The essays had themes that indicated their fear of failing the state test, insecurity of understanding mathematical concepts and despair over self-efficacy and self-competency. While intervening to aid the students was a professional responsibility, it also presented ethical dilemma of proceeding with research or stopping to assist participants. The Chair of the Dissertation Committee was consulted and the decision was made to offer the additional support services. Permission was given to support the students' needs noting the ethical

obligation of meeting the needs of participants when one discovers existing psychological concerns or issues arising during research.

The sample size, power and significance detecting a medium was not met with this research study ($n=47$). Cohen suggests an N of 64; for a large difference at the same power level, an N of 26 is suggested. To detect a medium difference at power .80 for a multiple regression, 84 and 91 participants are suggested for four and five independent variables, respectively.

Data collection instrument limitations, such as the length of the MARS-A (98 items) and MAACL-R (132 adjectives), may have altered the accuracy of the responses, an instrumentation threat. Examinee motivation on instruments, particularly those who may experience test anxiety, can be impacted by test length, Taylor and Deane (2002). Although the MARS-A was used in conjunction with the MAACL-R with an adapted version, students complained about the length of both instruments. Students did not complain while responding to the modified version of the PILL, which was 20 items, but had questions about some of the symptoms.

In spite of the limitations noted on the research, the study contributes useful information, though the findings are not consistent with much of the previous research. These studies also added to the research of knowledge as well as provide information that can be potentially helpful in understanding the relationship of these variables of stress, anxiety, math anxiety, cognitive and psychological processes to the Virginia Standard of Learning mathematics' performance for high school students.

Discussion

Expressive writing is a brief writing intervention that has shown positive outcomes on a variety of subjects for a variety of conditions. When the researcher first approached the lead math teacher about the expressive writing intervention and teaching the second part of the geometry course during first semester, the idea was met with opposition. It was expressed that students should retake the entire course and take the SOL test during the spring administration in May. After consulting with the principal, on possible advantages of not waiting, the decision was made to offer the course during the first semester to benefit students.

During the expressive writing intervention, students met the researcher in one of the computer labs and completed the first writing topic. On Day 1, the experimental group was asked about their feelings towards mathematics. Participants began to write immediately, non-stop. The level of engagement generated teacher's comments regarding how eager they were in responding to the topic. The students' willingness to share their thoughts resulted in the researcher reading the results immediately that evening after school. After reading each essay, information shared from the experimental group indicated a sense of hopelessness regarding their past and previous math performance. For the researcher, the expressive writing exercise confirmed the importance of giving students a voice and listening to their needs. The researcher felt compelled to share the overall comments with the chair of the dissertation committee inquiring if and what support could be given to students. After collaboration, the researcher was encouraged to move forward in assisting students. A team of educators were called for a meeting consisting of the division's math supervisor, the math coach

and the teachers of the course. Results from the meeting yielded strategies for students in both the experimental and control group which included tutorial during school, with necessary pull-outs from other classes, and Saturday school. Teachers were willing to hold the sessions at the school or at a site in the community. Willingness of the teacher's response indicated their commitment to utilize information from the expressive writing intervention to help students reduce their anxiety. Results from the expressive writing intervention indicated the student's fear of failing the state test, insecurity of understanding mathematical concepts, despair over self-efficacy and self-competency, and a strong desire to receive a high school diploma all adding to the levels of the student's emotional anxiety.

Anxiety

The expressive writing intervention was effective, as evidenced by statistically significant results for the experimental group in reducing anxiety within group comparison from pretest to posttest. The posttest between group comparisons indicated statistical significance in anxiety with a reduction in anxiety for the experimental group with an increase in anxiety for the control group. In an effort to improve academic performance, allowing students an opportunity to express their feelings, could initiate early interventions from teachers and counselors in reducing anxiety strategies. Anxiety is a prevalent problem among young people. Although identification and treatment of anxiety occurs often during early adulthood, approximately half of those treated for anxiety indicate an earlier onset during childhood or adolescent years (APA, 2000). High test anxious individuals experience physiological changes (e.g., increased heart rate) and the negative emotional reactions of state anxiety, triggering them to attempt to

avoid or minimize the testing threat, depending on the degree to which a test is viewed as being threatening (Spielberger, 1995).

Math Anxiety

Results from the pretest to posttest within group comparison indicated the expressive writing intervention was effective in reducing math anxiety as evidenced by the experimental group reporting statistically significant decreased levels of math anxiety. Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. The expressive writing appeared to be therapeutic for both groups whether they wrote on a value-laden topic or a neutral topic. Math anxiety is consistently related to math performance (e.g., Hembree, 1990; Liebert & Morris, 1967; Hsiu-Zu, et al., 2000). Researchers have found correlations commonly within the $-.11$ to $-.36$ range, a small negative relationship pointing out that students with higher levels of math anxiety are inclined to have lower levels of math performance (e.g., Hembree, 1990; Ma, 1999). Math anxiety, according to numerous studies (e.g., Betz, 1978, Hembree, 1990; Liebert & Morris, 1967; Ma, 1999,) has been found to have a consistent but small negative relationship with math achievement with students experiencing high levels of math anxiety performing at lower mathematic levels academically.

Math anxiety may pose a concern for career and technical educational students because many students suffering from math anxiety have little confidence in their ability to do math, and tend to take a minimum number of required math courses; this limits their career choice options (Scarpello, 2007). It is also noted by Scarpello, that math anxiety can begin as early as grade four and increases during middle and high school

which can be caused by past classroom experiences, parental influences, and remembering poor past math performance.

Math anxiety can begin as early as grade four and increases during middle and high school which can be caused by past classroom experiences, parental influences, and poor past math performance (Scarpello, 2007). It was apparent, after reviewing the results, that math anxiety, needed math skills, and unsuccessful standardized tests have been a problem for many of the students. Information sharing and collaborative measures are essential, not only in math, but for the entire school in meeting academic goals.

Stress

Results on perceived stress did not show significant differences during the pretest or posttest between groups. The experimental group disclosed emotional feelings about the value-laden topics during the writing intervention which may have attributed to their higher levels of stress during this study. Highly anxious students in stressful situations may be more susceptible to unwanted failure in math despite often showing competency in other areas (Beilock, 2008). This body of research could be used in early detection of student stress through the expressive writing intervention.

Mathematics SOL Results

Results from the end- of-course testing of the math SOL resulted in the experimental expressing writing group scoring at a 52% pass rate, a 48% failure rate with 39% of participants from the failure group falling in the expedited re-take range. The control group had a 49% pass rate, a 51% failure rate with 27% of the participants falling in the expedited re-take range. Participant who scored between 375 and 399 (expedited range) were allowed another opportunity to retest within a week with

remediation prior to retaking the SOL's. As students become less anxious about their math performance, they may make less careless mistakes on the various types of computations (Beilock, 2008), their test scores may improve, and they can be better prepared for the future while experiencing more confidence in their approach to learning.

Mathematics' Performance

The experimental and the control group experienced decreases in their mean mathematics scores from pretest to posttest, though not statistically significant. The means varied slightly between the pretest scores between the experimental group and the control group as measured by the Mathematics' Practice Standard of Learning Test. Results indicated the control group had higher mean scores on the Mathematics' Practice Standard of Learning Test than the experimental group during the posttest between groups comparison. The participants in this study were enrolled in the geometry class due to failing the course the previous semester. Some students may have failed the course more than one time indicating poor previous math performance. This body of research was used to open opportunities for students to experience success in passing the SOL mathematics test through expressive writing.

Mathematical understanding and high school assessments provide adolescents with skills and experiences that pave the way to both college and careers (Brown & Conley, 2007). Students decrease their level of math courses needed due to poor experiences and some due to lack of knowledge of what skills are needed in various careers. This approach should start at elementary school and continue through high school. Shapka, Domene, and Keating (2006), looked at math being a filter in career

aspirations and noted that math achievement shaped careers of students from grade nine through their post secondary schooling.

Cognitive Processes

Statistically significant differences were found between Day 1 and Day 3 mean scores within group comparison for both the control and experimental groups on cognitive processes. Smyth et al. (2001) posits that narrative formation and coherence are necessary for expressive writing to be beneficial. Harber and Pennebaker (1992) explain that cognitive processing helps to organize and structure the memory and therefore creates a more adaptive schema related to the traumatic or stressful event. Results from this research could be used in teachers working with students on how in organizing their thoughts for better understanding. Math teachers could have students show their work on a problem, giving partial credit for analyzing their thoughts on paper indicating what went wrong in multi-step math problems.

Statistical significant differences were found within group for the experimental group on psychological processes category in social processes, friends, and humans areas. Within group results for the control group indicated statistical significance in psychological processes category in social processes, family, affective process, positive emotions, negative emotions and anger. Between groups comparisons revealed the experimental group used more negative words and words expressing anger, anxiety and sadness on both Day 1 and Day 3 than the control group. The control group used more positive words and happy words in their writing with some indication of anxiety than the experimental group. This research could be used in allowing students opportunities to express their feeling through writing which may be beneficial in improving and

sustaining student academic and social success. The expressive writing intervention may be one of the first tools needed to assist schools in identifying the individual needs of their students.

The degree to which people express emotions and how they express emotions can tell what they are experiencing (Tausczik & Pennebaker, 2010). During the expressive writing intervention, the experimental group indicated mixed emotions in anxiety, anger and sadness when expressing their thoughts on how they felt about mathematics.

Implications for School Counselors

This study used Expressive Writing as an intervention to reduce anxiety and stress that could be contributing to poor test performance. This should be of particular interest to school counselors as they work towards closing the achievement gap. As a result of this research, counselors could have students journal their thoughts and discuss with them ways to improve social and academic skills. This can be done as individual counseling and could start at the beginning of school year as counselors try to get to know their students. They could have them write about their best subject and why and maybe at subsequent meeting, students could share information regarding subjects they struggle with and what could help them. The expressive writing intervention could be implemented in conjunction with SOL preparation, study groups, and groups offering test taking strategies. Counselors could also take data from marking periods and meet with students in small groups and write about why they have grades that are not successful and thoughts about what would be beneficial in helping them.

Approximately one out of every eight students will struggle with anxiety (Wagner, 2005) and the social, emotional, and academic well being of students depend on the involvement and support of the school counselor. Results from this research

could be used for school counselor to educate and support school personnel in early identification of students with stress and anxiety and implementation through early interventions. The school counselor can work with school administration to identify various resources and ways to educate staff, parents and other stakeholders on student stress and anxiety during community and in-school staff in-service training. Through collaboration with teachers, administrators, families and community resources, the next generation of school counselors will have acquired the knowledge and skills to work in collaboration with other school stakeholders to meet the academic needs of students (Dahir, 2009). Resources including books, materials on stress and anxiety, as well as results from this study may be used to educate all stakeholders. Young people often imitate their parents' methods of handling stress. Therefore, it is important to consider family dynamics and include the parents when working with students (Matos et al., 2008). School counselors, by communicating with families, can help students examine their expectations and assess the effects that these expectations may have on their level of stress and anxiety.

An integral role of school counselors is to support the school community by assisting school personnel in identifying student's needs and implementing supportive interventions (Hanie & Stanard, 2009). School counselors are in a powerful position to show how they can complement student success through promoting academic rigor (Stone & Dahir, 2006). From the research counselors, within this urban school division, could review the academic profile of each student on their case load. Seniors in a position of not graduating without passing the Virginia Standard of Learning geometry

test could benefit from early interventions to support anxiety, stress, or any obstacles impeding their success.

This body of research further adds to the urgency of including and viewing the school counselor as a key person in decreasing anxiety and stress through expressive writing, as a strategy for academic success in schools. School counselors have access to student's grades during each marking period. This data could be used in assisting those failing students. Students in this study experienced levels of stress and anxiety through failing a math course that could impede graduation. School counselors could use the data from this research to help students decreasing levels of stress and anxiety through various types of groups or individual counseling. Results from the expressive writing intervention could be used by counselors during classroom guidance.

Implications for Private Practice or Other Counselors Working with Children and Adolescents

Students may have outside counseling sources to assist them with coping with life challenges. Counselors can work collaboratively with day treatment counselors and in-home counselors dealing with the common issues of ADHD, ODD, behavioral issues, and anger issues as they observe and identify behaviors that may prevent the students from excelling socially and academically. The treatment of anxiety focuses on identifiable symptoms and behaviors rather than a specific diagnosis. Preventions and treatments can be discussed with health professionals prior to a diagnosis (Wagner, 2005). The expressive writing intervention used in this research could serve as a means to reducing anxiety in students, thus improving their academic performance as well as exhibiting more positive social behaviors.

Expressive writing is a therapeutic exercise which allows individuals an opportunity to write about emotional issues or anything that is blocking progress, i.e. grades, health, personal and social growth. Writing rather than talking about situations often times opens a way for information to flow and improves how we process information. Cognitive Processing – organizing their thoughts: Psychological Processing – how they respond to family, friends, social groups. Emotional cues such as sadness, happiness, and hostility when recognized, could help in supporting progress for clients.

Professional counselors could work with school administrators by strategically planning and establishing groups in improving attendance, academic progress, and behavior. Facilitating parent workshops, as well as faculty workshops could be viewed as growth opportunities for counseling professionals could share while working with children and adolescents. There has to be a team effort between all stakeholders when working with students. As a result of this research, professionals in social work as well as those in private practice could use expressive writing as a source of gaining insight and understanding of how their client's feel. A variety of school related factors are negatively associated with anxiety including poor sleep (Mayers, Grabau, Campbell, & Baldwin, 2009), school connectiveness (Shochet, Dadds, Ham, & Montague, 2006), and school refusal (McShane, Walter, & Rey, 2001).

Implications for Counselor Educators

University and college professors could share strategies on how to recognize anxiety and stress in students and various ways to use in ways to get to know their students. They could also share various mean of communication when students are reluctant in talking with their school counselor. The expressive writing intervention

could serve as one way in which counselors can get to know students and counseling educators could share insight on what to look for when reviewing what student's have written.

Educating future counselors in supporting the needs of students is one step towards supporting the school's goals and visions. Traditional counseling roles are evolving and creativity in meeting the challenges of students is essential as the profession moves forward. University and college professors could provide course work in ways to use data as they support the division goals of academic success for all students. Collaboration with PreK-12 schools is essential in establishing partnerships and being current about the day to day dynamics within schools and encourage expressive writing interventions during practicum and internship experiences. Applying knowledge and theories to the population of students within schools may serve as a practical way to get upcoming school counselors aware of school expectations.

This body of research strived to bring awareness to counseling educations in the hope of strengthening the profession through commitment in widening the opportunity gaps and closing the achievement gaps that are leaving so many students behind. This starts in knowing their students and meeting the needs of their students in areas outlined in this research.

Implications for Schools

Principals are tasked with serving all students, meeting annual yearly progress (AYP), benchmarks for SOL's, attendance benchmarks, and meeting requirements for on time graduation while creating safe and orderly schools. As students become less anxious about their math performance, they may make fewer careless mistakes on the various types of computations (Beilock, 2008), their test scores may improve, and they

can be better prepared for the future while experiencing more confidence in their approach to learning. Schools are being creative in trying to meet these goals; however, new strategies are needed to include all staff and personnel.

In reviewing the writing samples from the expressive writing intervention, students in the experimental group expressed high levels of math anxiety. Teachers could use this research in allowing students an opportunity to express math concerns or any content concerns during the beginning of the school year which could be beneficial for students and teachers. Identifying the problem and discussing strategies together would support decreasing anxiety students may feel. Many students will remain unidentified and unsupported without the involvement of school personnel. Using this research to educate school personnel during staff development or in-service training would better educate personnel on the importance of expressive writing in possibly indicating signs of stress and anxiety among the student body.

Teacher's interaction with students may often lead to developing a rapport with them and thus, teachers may be the first individuals to recognize stress and anxiety in students (Wagner, 2005). Teachers can participate in a school in-service on how to use and assess the writing activity used in the experimental group during this study. The writing activity may be used in all classes as a pre-assessment of students' thoughts of the academic area being taught. Based on guidelines shared at the in-service teacher may referred to guidance, in a timely manner, names of students who may benefit from group sessions and or other assistance.

The traditional teaching method of asking students to raise their hands is not helpful for a student who never raises his/her hand because he/she would not have the

answer. Allowing students to write down their thoughts, without putting their names on their papers, could open the dialogue for what is needed to help students who are not progressing in a content area. Math has to be more than computations; it has to be an arena of investigation in order for students to understand and enjoy mathematics (Newby, 2004). Incorporating pre-and post- writing activities in mathematics may allow students to explore their strengths and address their derailers in the content area.

Many students are experiencing stress and anxiety that may be a result of peer and community pressure. Other school issues such as bullying, low self esteem, socioeconomic status are some of the challenges students are facing contributing to anxiety, stress and poor academic performance along with community and family issues. Students need to have a forum where they can discuss these challenges and expressive writing could be one way to start the dialogue. Meeting the needs of students should be top priority in preparation for their future. Taking rigorous course work, obtaining high grades, and participating in clubs and activities are element of the holistic growth needed to prepare students to be college, career and citizenship ready will be difficult for some without early interventions.

Implications for Stakeholders

Stakeholders need to be informed and educated on what strategies and interventions are being used in the schools to prepare students for post-secondary education, and the workforce. Partnering with community leaders, establishing mentoring programs, preparing students for community service activities and inviting these services to share their knowledge and experiences with students would assist with educating the whole child as well as help eliminate social barriers that may impede academic success. Exposing students to a plethora of information and professions to

address skills needed in various careers should be ongoing and could make a difference in student's life long career choices.

Parents, community leaders, school board members, and legislative representatives could benefit from a student forum noting some of the challenges high school students face as they work towards being successful. This body of research clearly outlined the use of expressive writing in viewing some of the challenges students faced through their anxiety and stress levels, as well as their cognitive and psychological processing through math. As noted earlier, the experiences are not isolated to one content and everyone with a vested interest in shaping this country's future should continue ongoing dialogue to support our students as well as our educational system. Educating our stakeholders with information regarding strategies for academic success, such as expressive writing, will build stronger partnerships and encourage commitment to the various challenges faced by students.

Implications for Future Research

There is a considerable lack of research on test anxiety reduction programs for students including those at the elementary, middle, and secondary levels (Ergene, 2003), with most of the existing research focusing on college populations. More test anxiety (Wigfield, 1989, Hembree, 1988) and math anxiety (Luzzo, Hasper, Albert, Bibby, & Martinelli, 1999; Furner & Duffy, 2002) interventions are needed to address the development of related anxiety components experienced by students. Future research is needed to see if grades would improve as a result of an expressive writing intervention with a reduction in stress and anxiety. Using other course content in areas where students are not meeting with success could be used use within grade levels. Identifying student's

concerns through expressive writing would be instrumental in giving voice to students. This would also allow collaborative effects between families, educators, professional counseling agencies, stakeholders and school educators in partnering for academic and social success for all students. Using expressive writing on higher level math level students in examining their anxiety and stress level as well as their cognitive and psychological processes in comparison to students in lower level math.

Conclusion

The purpose of this mixed method model research design was to see if there is an effect on anxiety, stress and mathematics anxiety using a short term intervention. Quantitative research methods were used to explore the effects of the interventions, to compare changes in the groups pretest to posttest, and to investigate the association between variables. Qualitative research was explored on cognitive processes, and psychological processes, analyzing writing samples using the Linguistic Inquiry Word Count (LIWC-2001) software, to see if changes occurred as a result of writing on either a value-laden or neutral topic over three days. An additional area that was explored was to see if there was an effect on the Virginia Standard of Learning (SOL) practice scores for students who are considered to be at risk because of previous academic achievement in mathematics at an urban high school.

It has become increasingly urgent to find ways to reduce the failure rate on the mathematics Standard of Learning Test, prior to 2014 when No Child Left Behind Act expects a 100% pass rate. Many cognitive interventions have been implemented, such as tutoring, study sessions, and Saturday school. Little attention has been given to addressing the psychological aspects, such as anxiety and stress. This study examined

those psychological constructs as related to performance on practice SOL mathematics tests, and investigated the effects of a short term writing intervention on these constructs and on performance. Results from this study resulted in a decrease in anxiety and an increase in the final SOL mathematics' test. The expressive writing analyses indicated the benefits of allowing participants an opportunity to organize their thought process and share information regarding their feelings in areas which could result in academic improvement.

There is a large body of research on the expressive writing paradigm as an intervention with clinical populations. Previous studies on expressive writing have demonstrated its positive effects on health benefits with limited research on adolescents. This study will add to the research of knowledge as well as provide information that can be potentially helpful in understanding the relationship of these variables to academic performance for students.

REFERENCES

- Achenbach, T.M., & Rescorla, L.A. (2006). *Multicultural understanding of child and adolescent psychopathology: Implications for mental health assessment*. New York: Guilford Press.
- Alpert, R., & Haber, R. (1960, September). Anxiety in academic achievement situations. *The Journal of Abnormal and Social Psychology*, 61(2), 207-215. Retrieved July 20, 2009, doi:10.1037/h0045464
- Alva, S., & Reyes, R. (1999). Psychosocial stress, internalized symptoms, and the academic achievement of Hispanic adolescents. *Journal of Adolescent Research*, 14(3), 348-358.
- American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV*. 4th edition. Washington DC: American Psychiatric Association.
- Anton, W.D., & Klisch, M.C. (1995). Perspectives on mathematics anxiety and test anxiety. Spielberger, C.D., and Vagg (Eds.) *Test anxiety: Theory, assessment, and treatment* (pp. 93-106). Washington, D.C.: Taylor & Francis.
- Ashcraft, M. (2002, October). Math Anxiety: Personal, Educational, and Cognitive Consequences. *Current Directions in Psychological Science*, 11(5), 181-185. Retrieved August 23, 2009, from Academic Search Complete database.
- Aysan, F., Thompson, D., & Hamarat, E. (2001, December). Test Anxiety, Coping Strategies, and Perceived Health in a Group of High School Students: A Turkish Sample. *Journal of Genetic Psychology*, 162(4), 402. Retrieved July 22, 2009, from Academic Search Complete database.

- Atweh, B., Forgasz, H., & Nebres, B. (Eds.) (2001). *Sociocultural research on mathematics education: An international perspective*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Baloğlu, M. & Koçak, R. (2006). A multivariate investigation of the differences in mathematics anxiety. *Personality and Individual Differences*, 40, 1325-1335.
- Bandalos, D., Yates, K., & Thorndike-Christ, T. (1995, December). Effects of math self-concept, perceived self-efficacy, and attributions for failure and success on test anxiety. *Journal of Educational Psychology*, 87(4), 611-623. Retrieved August 9, 2009, doi:10.1037/0022-0663.87.4.611
- Beilock, S.L., (2008). Math performance in stressful situations. *Psychological Science*, 17(5), 339-343.
- Bembenutty, H. (2008). Self-Regulation of Learning and Test Anxiety. *Psychology Journal*, 5(3), 122-139.
- Betz, N. (1978, September). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Counseling Psychology*, 25(5), 441-448. Retrieved August 9, 2009, doi:10.1037/0022-0167.25.5.441
- Bodas, J., & Ollendick, T. (2005). Test anxiety: A cross-cultural perspective. *Clinical Child and Family Psychology Review*, 8(1), 65-88.
- Bodas, J., Ollendick, T., & Sovani, A. (2008, December). Test anxiety in Indian children: A cross-cultural perspective. *Anxiety, Stress & Coping: An International Journal*, 21(4), 387-404. Retrieved August 13, 2009, doi:10.1080/10615800701849902

- Bos, B. (2007). The effect of Texas Instrument Inter-Active, instructional environment on the mathematical achievement of eleventh-grade low-achieving students. *Journal of Educational Computing Research*, 37(4), 350-368.
- Broderick, J., Stone, A., Smyth, J., & Kaell, A. (2004, January). The Feasibility and Effectiveness of an Expressive Writing Intervention for Rheumatoid Arthritis via Home- Based Videotaped Instructions. *Annals of Behavioral Medicine*, 27(1), 50-59. Retrieved August 23, 2009, from Psychology and Behavioral Sciences Collection database.
- Brown, T., Chorpita, B., & Barlow, D. (1998, May). Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect, and autonomic arousal. *Journal of Abnormal Psychology*, 107(2), 179-192. Retrieved July 28, 2009, doi:10.1037/0021-843X.107.2.179
- Brown, R., & Conley, D. (2007, June). Comparing State High School Assessments to Standards for Success in Entry-Level University Courses. *Educational Assessment*, 12(2), 137-160. Retrieved August 9, 2009, doi:10.1080/10627190701232811
- Bruner, C.C., Smith, M.S., & Womack, W.M. (2004). Factors related to school absenteeism in adolescents with recurring headache. *Headache: The Journal of Head and Face Pain*, 44(3), 217-222.
- Carter, R., Williams, S., & Silverman, W. (2008). Cognitive and emotional facets of test anxiety in African American school children. *Cognition and Emotion*, 22(3), 539-551.

- Casbarro, J. (2004). Reducing anxiety in the era of high-stakes testing. *Principal*, 83(5), 36-38.
- Chapell, M., Blanding, Z., Silverstein, M., Takahashi, M., Newman, B., Gubi, A., & McCann, N. (2005). Test Anxiety and Academic Performance in Undergraduate and Graduate Students. *Journal of Educational Psychology*, 97(2), 268-274.
- Chaplin, T.M., Gillham, J.E., & Seligman, M.E.P. (2009). Gender, anxiety, and depressive symptoms: A longitudinal study of early adolescents. *The Journal of Early Adolescence*. 29 (2), 307-327.
- Chung, C. K., & Pennebaker, J. W. (2008). Revealing dimensions of thinking in open-ended self-descriptions: An automated meaning extraction method for natural language. *Journal of Research in Personality*, 42(1), 96-132.
doi:10.1016/j.jrp.2007.04.006
- Cizek, G. J., & Burg, S. S. (2006). *Addressing test anxiety in a high stakes environment: Strategies for classrooms and schools*. Thousand Oaks, CA: Corwin Press.
- Clark, L., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, 100 (3), 316-336.
- Cohen, G., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention. *Science*, 313, 1307-1310.
- Colligan, M., Pennebaker, J., & Murphy, L. (1982). *Mass psychogenic illness: a social Psychological analysis*. Hillsdale: Lawrence Erlbaum Associates.
- Corter, A., & Petrie, K. (2008, February). Expressive writing in context: The effects of a confessional setting and delivery of instructions on participant experience and

language in writing. *British Journal of Health Psychology*, 13(1), 27-30.

Retrieved August 23, 2009, doi:10.1348/135910707X250929

Cottrell, S. (2007). *The exam skills handbook: Achieving Peak Performance*.

Basingstoke, Hampshire; New York: Palgrave Macmillan.

Dahir, C. (2009). School counseling in the 21st century: where lies the future?

Journal of Counseling & Development, 87, 3-5.

Danoff-Burg, S., Agee, J.D., Romanoff, N.R., Kremer, J.M., & Strosberg, J.M. (2006).

Benefit finding and expressive writing in adults with lupus or rheumatoid

arthritis. *Psychology and Health* 21(5), 651-665.

D'Souza, P., Lumley, M., Kraft C., & Dooley, J. (2008, July). Relaxation Training and

Written Emotional Disclosure for Tension or Migraine Headaches: A

Randomized, Controlled Trial. *Annals of Behavioral Medicine*, 36(1), 21-32.

Retrieved August 23, 2009, doi:10.1007/s12160-008-9046-7

Dew, K., Galassi, J., & Galassi, M. (1984, October). Math anxiety: Relation with

situational test anxiety, performance, physiological arousal, and math avoidance

behavior. *Journal of Counseling Psychology*, 31(4), 580-583. Retrieved August

9, 2009, doi:10.1037/0022-0167.31.4.580

Dion, K., & Toner, B. (1988, April). Ethnic Differences in Test Anxiety. *Journal of*

Social Psychology, 128(2), 165. Retrieved August 16, 2009, from Psychology

and Behavioral Sciences Collection database.

DiTomasso, R. A., & Gosch, E. A. (2002). *Comparative treatments for anxiety*

disorders. New York: Springer Publishing Company, Inc.

- Dugas, M.J., Marchand, A., & Ladouceur, R. (2005). Further validation of a cognitive-behavioral model of generalized anxiety disorder: Diagnostic and symptom specificity. *Journal of Anxiety Disorders*, 19, 329-343.
- D'Zurilla, T. J., & Sheedy, C. F. (1991). Relation between social problem-solving ability and subsequent level of psychological stress in college students. *Journal of Personality and Social Psychology*, 61(5), 841-846. doi:10.1037/0022-3514.61.5.841
- Endler, N., & Kocovski, N. (2001). State and trait anxiety revisited. *Journal of Anxiety Disorders*, 15, 231-245.
- Ergene, T. (2003). Effective interventions for test anxiety reduction: A meta-analysis. *School Psychology International*, 24(3), 313-328.
- Esterling, B.A., L'Abate, L., Murray, E.J., & Pennebaker, J.W. (1999). Empirical foundations for writing in prevention and psychotherapy: Mental and physical health outcomes. *Clinical Psychology Review*, 19(1), 79-96.
- Everson, H.T., Millsap, R.E., & Rodriguez, C.M. (1991). Isolating gender differences in test anxiety: A confirmatory factor analysis of the test anxiety inventory. *Educational and Psychological Measurement*, 51, 243-251.
- Feingold, A. (1994, November). Gender differences in personality: A meta-analysis. *Psychological Bulletin*, 116(3), 429-456. Retrieved August 15, 2009, doi:10.1037/0033-2909.116.3.429
- Firestone, W. A. & Mayrowetz, D. (2000). Rethinking 'high stakes': Lessons learned from the United States and England and Wales. *Teachers College Record*, 102(4), 724-749.

- Folkman, S. (2008, January). The case for positive emotions in the stress process. *Anxiety, Stress & Coping*, 21(1), 3-14.
- Fratraroli. J. (2006). Experimental disclosure and its moderators: A meta-analysis. *Psychological Bulletin*, 132, 823-865.
- Frenzel, A.C., Pekrun, R., & Goetz, T. (2007). Perceived learning environment and students' emotional experiences: A multilevel analysis of mathematics classrooms. *Learning and Instruction*, 17(5), 478-493.
- Frisina, P.G., Borod, J.C., & Lepore, S.J. (2004). A meta-analysis of the effects of written emotional disclosure on the health outcomes of clinical populations. *Journal of Nervous and Mental Disease*, 192, 629-634.
- Fuchs, L., Bahr, C., & Rieth, H. (2001). Effects on goal structures and performance contingencies on the math performance of adolescents with learning disabilities. *Journal of Learning Disabilities*, 22(9), 554-560.
- Furner, J.M., & Duff, M.L. (2002). Equity for all students in the new millennium: Disabling math anxiety. *Intervention in School and Clinic*, 38 (67), 67-74.
- GBos, B. (2009). Technology with cognitive and mathematical fidelity: what it means for the math classroom. *Computers in the Schools*, 26, 107-114.
- Gortner, E.M., Rude, S.S., & Pennebaker, J.W. (2006). Benefits of expressive writing in lowering rumination and depressive symptoms. *Behavior Therapy*, 37, 292-303.
- Graf, M., Guadiano, B., & Geller, P. (2008). Written emotional disclosure: A controlled study of the benefits of expressive writing homework in outpatient therapy. *Psychotherapy Research*, 18(4), 389-399. Retrieved August 23, 2009, doi:10.1080/ 0503300701691664

- Graybeal, A., Sexton, J., & Pennebaker, J. (2002). The role of story-making in disclosure writing: the psychometrics of narrative. *Psychology and Health*, 17(5), 571-581.
- Hanie, E., & Stanard, R. (2009). Students with anxiety: the role of the professional school counselor. *GSCA Journal*, 16(1), 49-55.
- Harber, K. D., & Pennebaker, J. W. (1992). Overcoming Traumatic Memories. In S. Christianson (Ed.), *The handbook of emotion and memory* (pp. 359-386). Hillsdale N.J.: L. Erlbaum Associates.
- Harris, A.H.S. (2006). Does expressive writing reduce health care utilization: A meta-analysis of randomized trials. *Journal of Consulting and Clinical Psychology*, 74 (2), 243-252.
- Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research*, 58, 47-77.
- Hembree, R. (1990). The Nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education*, 21(1), 33-46.
- Hill, K., & Sarason, S. (1966). The relation of test anxiety and defensiveness to test and school performance over the elementary-school years. *Monographs of the Society for Research in Child Development*, 31(2), 1-76. Retrieved August 16, 2009, doi:10.2307/1165770
- Hill, K., & Wigfield, A. (1984, September). Test Anxiety: A Major Educational Problem and What Can Be Done About It. *Elementary School Journal*, 85(1), 105-126. Retrieved July 20, 2009, from Education Research Complete database.
- Hirsch, J. K., & Ellis, J. B. (1996). Differences in life stress and reasons for living among college suicide ideators and non-ideators. *College Student Journal*, 30, 377-386.

- Horton, A. (2004). The Academic Achievement Gap Between Blacks and Whites: The Latest Version of Blaming the Victim? *Journal of Human Behavior in the Social Environment*, 10(2), 57-70. <http://search.ebscohost.com.proxy.lib.odu.edu>, doi:10.1300/J137v10n02_03
- Hsiu Zu, H., Lam, A.G., Zimmer, J.M., Hong, S., & Okamoto, Y. (2000). The affective and cognitive dimensions of math anxiety: A cross-national study. *Journal for research in Mathematics Education*, 31(3), 362-379.
- Hughes, A., Lourea-Waddell, B., & Kendall, P. (2008, June 1). Somatic Complaints in Children with Anxiety Disorders and Their Unique Prediction of Poorer Academic Performance. *Child Psychiatry and Human Development*, 39(2), 211-220.
- Hyde, J., Fennema, E., & Lamon, S. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin*, 107(2), 139-155. <http://search.ebscohost.com.proxy.lib.odu.edu>, doi:10.1037/0033-2909.107.2.139
- Hyde, J.S., Lindberg, S.M., Linn, M.C., Ellis, A.B., Williams, C.C. (2008). Gender similarities characterize math performance. *Science*, 321, 494-495.
- Jain, S., & Dowson, M. (2009). Mathematics anxiety as a function of multidimensional self-regulation and self-efficacy. *Contemporary Educational Psychology*, 34, 240-249.
- Just, U., Oelkers, R., Bender, S., Parzer, P., Ebinger, F., Weisbrod, M., & Resch. (2003, April). Emotional and behavioral problems in children and adolescents with primary headache. *Cephalalgia*, 23(3), 206-213. Retrieved August 24, 2009, doi:10.1046/j.1468-2982.2003.00486.x

- Kellow, T., & Jones, B. (2008). The effects of stereotypes on the achievement gap: Reexamining the academic performance of African American high school students. *Journal of Black Psychology, 34*(94).
- Keogh, E., & French, C. (2001, March). Test anxiety, evaluative stress, and susceptibility to distraction from threat. *European Journal of Personality, 15*(2), 123-141. Retrieved July 20, 2009, doi:10.1002/per.400
- Klein, K., & Boals, A. (2001, September). Expressive Writing Can Increase Working Memory Capacity. *Journal of Experimental Psychology / General, 130*(3), 520. Retrieved August 17, 2009, from Academic Search Complete database.
- King, N., Mietz, A., Tinney, L., & Ollendick, T. (1995, March). Psychopathology and cognition in adolescents experiencing severe test anxiety. *Journal of Clinical Child Psychology, 24*(1), 49-54. Retrieved July 20, 2009, from PsycINFO database.
- Laccetti, M. (2007, September). Expressive Writing in Women with Advanced Breast Cancer. *Oncology Nursing Forum, 34*(5), 1019-1024. Retrieved August 18, 2009, doi:10.1188/07.ONF.1019-1024
- Landry, D., Rachal, K., Rachal, W., & Rosenthal, G. (2005, January). Expressive Disclosure Following an Interpersonal Conflict: Can Merely Writing About an Interpersonal Offense Motivate Forgiveness? *Counseling & Clinical Psychology Journal, 2*(1), 2-14. Retrieved August 23, 2009, from Academic Search Complete database.
- Lazarus, R., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

- Lee, J. (2006). Input-Guarantee versus performance-guarantee approaches to school accountability: Cross-state comparisons of policies, resources, and outcomes. *Peabody Journal of Education*, 81(4), 43-64.
- Lepore, S., & Greenberg, M. (2002). Mending broken hearts: effects of expressive writing on mood, cognitive processing, social adjustment and health following a relationship breakup. *Psychology & Health*, 17(5), 547-560.
- Lepore, S., & Smyth, J. (2002). The writing cure: An overview. *The writing cure: How expressive writing promotes health and emotional well-being* (pp. 3-14). Washington, DC, US: American Psychological Association.
- Linn, R. (2001, February). A Century of Standardized Testing: Controversies and Pendulum Swings. *Educational Assessment*, 7(1), 29-38. Retrieved July 22, 2009, from Academic Search Complete database.
- Livesley, W., Schroeder, M., Jackson, D., & Jang, K. (1994, February). Categorical distinctions in the study of personality disorder: Implications for classification. *Journal of Abnormal Psychology*, 103(1), 6-17. Retrieved July 28, 2009, doi:10.1037/0021-843X.103.1.6
- Liebert, R., & Morris, L. (1967). Cognitive and emotional components of test anxiety: A distinction and some initial data. *Psychological Reports*, 20(31), 975-978. Retrieved July 29, 2009, from PsycINFO database.
- Lumley, M. A., & Provenzano, K. M. (2003). Stress management through written emotional disclosure improves academic performance among college students with physical symptoms. *Journal of Educational Psychology*, 95(3), 641-649. doi:10.1037/0022-0663.95.3.641

- Luria, A. R. (1932/1976). *The nature of human conflicts*. (W.H. Grant, Trans.). New York: Liverwright.
- Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education*, 30 (5), 520-540.
- Ma, X., & Xu, J. (2004). The causal ordering of mathematics anxiety and mathematics achievement: a longitudinal panel analysis. *Journal of Adolescence*, 27, 165-179.
- Manier, D., & Olivares, A. (2005, January). Who Benefits from Expressive Writing? Moderator Variables Affecting Outcomes of Emotional Disclosure Interventions. *Counseling & Clinical Psychology Journal*, 2(1), 15-28. Retrieved August 18, 2009, from Academic Search Complete database.
- Matos, M.G., Tome, G., Borges, A.I., Manso, D., Fergeria, P., & Ferreira, A. (2008). Anxiety, depression, and coping strategies: Improving the evaluation and understanding of these dimensions during pre-adolescence, and adolescence. *Journal of Cognitive and Behavioral Psychotherapies*, 8, 169-184.
- Maxfield, L., & Melnyk, W. (2000, April). Single session treatment of test anxiety with eye movement desensitization and reprocessing (EMDR). *International Journal of Stress Management*, 7(2), 87-101. Retrieved July 20, 2009, doi:10.1023/A:1009580101287
- May, R. (1977). *The meaning of anxiety*. New York: Ronald Press Co.
- Mayers, A.G., Grabau, E.A.S., Campbell, C., & Baldwin, D.S. (2009). Subjective sleep, depression and anxiety: Inter-relationships in a non-clinical sample. *Human Psychopharmacology*, 29, 495-501.

- McFarland, D. (2006). Curricular Flows: Trajectories, Turning Points, and Assignment Criteria in High School Math Careers. *Sociology of Education*, 79(3), 177-205.
- McKeachie, W. J. (1951). Anxiety in the college classroom. *Journal of Educational Research*, 45, 153-160.
- McIlroy, D. & Bunting, B. (2002). Personality, behavior, and academic achievement: Principles for educators to inculcate and students to model. *Contemporary Educational Psychology*, 27, 326-337.
- Meichenbaum, D. (1972). Cognitive modification of test anxious college students. *Journal of Consulting and Clinical Psychology*, 39(3), 370-380.
- Meichenbaum, D. (1985). *Stress inoculation training*. New York: Pergamon Press.
- McShane, G., Walter, G., & Rey, J. (2001, December). Characteristics of adolescents with school refusal. *Australian & New Zealand Journal of Psychiatry*, 35(6), 822. Retrieved August 24, 2009, from Academic Search Complete database.
- National Science Foundation (2008). Elementary and secondary education. In *Science and Engineering Indicator, 2008* (chap. 1). Retrieved October 7, 2009, from <http://www.nsf.gov/statistics/seind08>.
- Naveh-Benjamin, M., Lavi, H., McKeachie, W. & Lin, Y. (1997, December). Individual differences in students' retention of knowledge and conceptual structures learned in university and high school courses: The case of test anxiety. *Applied Cognitive Psychology*, 11(6), 507-526. Retrieved July 19, 2009, doi:10.1002/(SICI)1099-0720(199712)11:6<507:AID-ACP482>3.3.CO;2-7

- Naveh-Benjamin, M., McKeachie, W., Lin, Y., & Holinger, D. (1981). Test anxiety: Deficits in information processing. *Journal of Educational Psychology*, 73(6), 816-824.
- O'Connor, D., & Ashley, L. (2008, September). Are alexithymia and emotional characteristics of disclosure associated with blood pressure reactivity and psychological distress following written emotional disclosure? *British Journal of Health Psychology*, 13(3), 495-512. Retrieved August 20, 2009, doi:10.1348/135910707X224496
- Ollendick, T. & King, N. (1994, October). Diagnosis, assessment, and treatment of internalizing problems in children: The role of longitudinal data. *Journal of Consulting and Clinical Psychology*, 62(5), 918-927. Retrieved July 19, 2009, doi:10.1037/0022-006X.62.5.918
- Osborne, J. (2007). Linking Stereotype Threat and Anxiety. *Educational Psychology*, 27(1), 135-154. <http://search.ebscohost.com.proxy.lib.odu.edu>, doi:10.1080/01443410601069929
- Pennebaker, J.W. (1982). *The psychology of physical symptoms*. New York: Springer-Verlag.
- Pennebaker, J.W., Burnam, M.A., Schaeffer, M.A., & Harper, D.C. (1977). Lack of control as a determinant of perceived physical symptoms. *Journal of Personality and Social Psychology*, 35(3), 167-174.
- Pennebaker, J. (1997). Writing about emotional experiences as a therapeutic process. *American Psychological Society*, 8(3), 162-166.

- Pennebaker, J., & Graybeal, A. (2001). Patterns of natural language use: disclosure, personality, and social integration. *American Psychological Society, 10*, 90-93.
- Pennebaker, J.W. & Chung, C.K. (2007). Expressive writing, emotional upheavals, and health. In H. Friedman and R. Silver (Eds.), *Handbook of health psychology* (pp.263-284). New York: Oxford University Press.
- Pennebaker, J.W., Mayne, T.J., & Francis, M.C. (1997), Linguistic predictors of adaptive bereavement. *Journal of Personality and Social Psychology, 72*, 863-871.
- Pennebaker, J., Mehl, M., & Niederhoffer, G. (2003). Psychological aspects of natural language use: our words, ourselves. *Annual Review Psychology, 54*, 547-577.
doi: 10.1146/annurev.psych.54.101601.125041
- Pennebaker, J., & King, L. (1999). Linguistic styles: language use as an individual difference. *Journal of Personality and Social Psychology, 77*(6), 1296-1312.
- Pennebaker, J. (2010). Expressive writing in a clinical setting. *Independent Practitioner, 23*-25.
- Petrie, K., Booth, R., Pennebaker, J., Davison, K., & Thomas, M. (1995, October). Disclosure of trauma and immune response to a hepatitis B vaccination program. *Journal of Consulting and Clinical Psychology, 63*(5), 787-792. Retrieved August 17, 2009, doi:10.1037/0022-006X.63.5.787
- Pina, A., & Eisenberg, N. (2009). Introduction to the special section: Prevention and remediation of emotional and academic problems in youth. *Child Development Perspectives, 3*(1), 1-3.

- Plake, B.S., & Parker, C.S. (1982). The development and validation of a revised version of the Mathematics Anxiety Rating Scale. *Educational and Psychological Measurement*, 42, 551-557.
- Putwain, D. (2007, September). Test anxiety in UK schoolchildren: Prevalence and demographic patterns. *British Journal of Educational Psychology*, 77(3), 579-593. Retrieved July 19, 2009, doi:10.1348/000709906X161704
- Rapee, R.M., Spence, S.H., Cobham, V., Wignall, A., & Psych, M. (2000). *Helping your anxious child: A step by step guide for parents*. New Harbinger Publications, Inc.: Oakland.
- Rapport, M., Denney, C., Chung, K., & Hustace, K. (2001, November). Internalizing Behavior Problems and Scholastic Achievement in Children: Cognitive and Behavioral Pathways as Mediators of Outcome. *Journal of Clinical Child Psychology*, 30(4), 536-551. Retrieved August 2, 2009, from Psychology and Behavioral Sciences Collection database.
- Ree, M.J., French, D., MacLeod, C., & Locke, V. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICA). *Behavioural and Cognitive Psychotherapy*, 36, 313-332.
- Reyes, M. (2008, October). South Texas Schools after NCLB: A Status Report. *International Journal of Learning*, 15(6), 249-252. Retrieved July 20, 2009, from Education Research Complete database.

- Richards, J.M., Beal, W.E., Seagal, J.D., & Pennebaker, J.W. (2000). Effects of disclosure of traumatic events on illness behavior among psychiatric prison inmates. *Journal of Abnormal Psychology, 109*(1), 156-160.
- Richardson, F., & Suinn, R. (1972). The Mathematics Anxiety Rating Scale: Psychometric data. *Journal of Counseling Psychology, 19*(6), 551-554.
<http://search.ebscohost.com.proxy.lib.odu.edu>, doi:10.1037/h0033456
- Richardson, F.C., & Woolfolk, R.L. (1980). Mathematics anxiety. In I.G. Sarason (Ed.), *Test anxiety: Theory, research, and application* (pp. 271-288). Hillsdale, NJ: Erlbaum.
- Rivkin, I.D., Gustafson, J., Weingarten, I., & Chin, D. (2006). The effects of expressive writing on adjustment to HIV. *Aids and Behavior, 10*(1), 13-26.
- Rhine, W., & Spaner, S. (1983). The structure of evaluative anxiety among children differing in socioeconomic status, ethnicity, and sex. *Journal of Psychology: Interdisciplinary and Applied, 115*(2), 145-158.
- Riggins-Newby, C. (2004). Playing math with the big boys. *Principal, 2*.
- Rothman, D. (2004). New approach to test anxiety. *Journal of College Student Psychotherapy, 18*(4), 45-60.
- Ryan, K.E., & Ryan, A.M. (2005). Psychological processes underlying stereotype threat and standardized math test performance. *Educational Psychologist, 40*, 1, 53-63.
- Safren, S., Gonzalez, E., Horner, K., Leung, A., Heimberg, R., & Juster, H. (2000). Anxiety in ethnic minority youth: Methodological and conceptual issues and review of the literature. *Behavior Modification, 24*, 147-183.

- Sanson, A., Hemphill, S., & Smart, D. (2004). Connections between Temperament and Social Development: A Review. *Social Development*, 13(1), 142-170.
- Sapp, M. (1999). *Test anxiety: Applied research, assessment, and treatment interventions* (2nd ed.). Lanham, MD: University Press of America.
- Sarason, I.G. (1978). The test anxiety scale: Concept and research. In C.D.
- Sarason, I. G. (1984). Stress, anxiety, and cognitive interference: Reactions to tests. *Journal of Personality and Social Psychology*, 46(4), 929-938. Retrieved July 20, 2009, doi:10.1037/0022-3514.46.4.929
- Sawyer Jr., T., & Hollis-Sawyer, L. (2005). Predicting Stereotype Threat, Test Anxiety, and Cognitive Ability Test Performance: An Examination of Three Models. *International Journal of Testing*, 5(3), 225-246.
- <http://search.ebscohost.com.proxy.lib.odu.edu>, doi:10.1207/s15327574ijt0503_3
- Scarpello, G. (2007). Helping students get past math anxiety. *Techniques: Connecting Education & Careers*, 82(82), 2.
- Selye, H. (1956). *The stress of life*. New York: McGraw-Hill.
- Selye, H. (1974). *Stress without distress*. (1st ed.). Philadelphia: Lippincott.
- Shapka, J., Domene, J., & Keating, D. (2006). Trajectories of career aspirations through adolescence and young adulthood: early math achievement as a critical filter. *Educational Research and Evaluation*, 12(4), 347-358.
- Simon, H., & Zieve, D. (2009). Stress. *Psychology and Behavioral Sciences Collection*, (31), 1-11.

- Smith, J. (2004). Understanding the process of stereotype threat: A review of mediational variables and new performance goal directions. *Educational Psychology Review*, 16 (3), 177-206.
- Smyth, J. (1998). Written emotional expression: Effect sizes, outcome types, and moderating variables. *Journal of Consulting and Clinical Psychology*, 66(1), 174-184. Retrieved July 21, 2009, doi:10.1037/0022-006X.66.1.174
- Smyth, J., & Helm, R. (2003, February). Focused expressive writing as self-help for stress and trauma. *Journal of Clinical Psychology*, 59(2), 227-235. Retrieved July 21, 2009, doi:10.1002/jclp.10144
- Soliday, E., Garofalo, J.P., & Rogers, D. (2004). Expressive writing intervention for adolescents' somatic symptoms and mood. *Journal of Clinical Child and Adolescent Psychology*, 33(4), 792-801.
- Somers, J., Goldner, E., Waraich, P., & Hsu, L. (2006, February). Prevalence and incidence studies of anxiety disorders: A systemic review of the literature. *Canadian Journal of Psychiatry*, 51(2), 100-113. Retrieved July 16, 2009, from Psychology and Behavioral Sciences Collection database.
- Spielberger, C. (1972). *Anxiety: current trends in theory and research*. New York: Academic Press.
- Spielberger & I.G. Sarason (Eds.), *Stress and Anxiety* (Vol. 5). New York: Hemisphere/Wiley.
- Spielberger, C., & Vagg, P. (1995). *Test Anxiety: Theory, assessment, and treatment*. Bristol, PA: Taylor & Francis.

- Steele, C. (1997, June). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, 52(6), 613-629. Retrieved July 29, 2009, doi:10.1037/0003-066X.52.6.613
- Stice, E., Shaw, H., Burton, E., & Wade, E. (2006, April). Dissonance and healthy weight eating disorder prevention programs: A randomized efficacy trial. *Journal of Consulting and Clinical Psychology*, 74(2), 263-275. Retrieved August 23, 2009, doi:10.1037/0022-006X.74.2.263
- Stice, E., Shaw, H., Burton, E., & Wade, E. (2006, April). Dissonance and healthy weight eating disorder prevention programs: A randomized efficacy trial. *Journal of Consulting and Clinical Psychology*, 74(2), 263-275. Retrieved August 23, 2009, doi:10.1037/0022-006X.74.2.263
- Stone, C., & Dahir, C. (2006). *The transformed school counselor*. Boston: Houghton Mifflin/Lahaska Press.
- Suinn, R., Edie, C., Nicoletti, J., & Spinelli, P. (1972, July). The MARS, a measure of mathematics anxiety: Psychometric Data. *Journal of Clinical Psychology*, 28(3), 373-375. Retrieved September 20, 2009, from Psychology and Behavioral Sciences Collection database.
- Suinn, R., & Edwards, R. (1982, July). The measurement of mathematics anxiety: The mathematics anxiety rating scale for adolescents-MARS-A. *Journal of Clinical Psychology*, 38(3), 576-580. Retrieved September 20, 2009, from Psychology and Behavioral Sciences Collection database.

- Suveg, C., Sood, E., Hudson, J.L., & Kendall, P.C. (2008). "I'd rather not talk about it": Emotion parenting in families of children with an anxiety disorder. *Journal of Family Psychology*, 22(6), 875-884.
- Tausczik, Y., & Pennebaker, J. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29(1), 24-54. DOI: 10.1177/0261927X09351676
- Tomb, M., & Hunter, L. (2004, April). Prevention of Anxiety in Children and Adolescents in a School Setting: The Role of School-Based Practitioners. *Children & Schools*, 26(2), 87-101. Retrieved August 24, 2009, from Academic Search Complete database.
- Traue, H., & Pennebaker, J. (1993). *Emotion inhibition and health*. Seattle: Hogrefe & Huber.
- Turner, B., Beidel, D., Hughes, S., & Turner, M. (1993, June). Text anxiety in African American school children. *School Psychology Quarterly*, 8(2), 140-152. Retrieved July 20, 2009, doi:10.1037/h0088835
- Wagner, A.P. (2005). *Worried no more; Help and hope for anxious children* (2nd ed). Rochester, New York: Lighthouse.
- Walpole, M., & McDonough, P. (1995). This test is unfair. *Urban Education*, 40, 321-349.
- Walton, G.M., & Cohen, G.L. (2003). Stereotype lift. *Journal of Experimental Social Psychology*, 39, 456-467.
- Warner, J.L., Lumley, M.A., Casey, R.J., Pierantoni, W., Salazar, R., Zoratti, E.M., Enberg, R., & Simon, M.R., (2006). Health effects of written emotional

- disclosure in adolescents with asthma: A randomized, controlled experiment. *Journal of Pediatric Psychology*, 31(6), 557-568.
- Watkins, C. (2009). *Teens at risk*. Farmington Hills, MI: Greenhaven Press/Gale Cengage Learning.
- Watson, D., & Clark, L. A. (1997). Measurement and Mismeasurement of Mood: Recurrent and Emergent Issues. *Journal of Personality Assessment*, 68(2), 267-297.
- Watt, K., Powell, C., Mendiola, I., & Cossio, G. (2006). School wide impact and AVID: How have selected Texas high schools addressed the new accountability measures? *Journal of Education for Students Placed at Risk*, 11(1), 57-73.
Retrieved July 20, 2009, doi:10.1207/s15327671espr1101_4
- Wenzel, A., & Holt, C.S. (2003). Social-evaluative threat and cognitive performance in socially anxious and nonanxious individuals. *Personality and Individual Differences*, 34, 283-294.
- Wine, J.D. (1971). Test anxiety and the direction of attention. In I. G. Sarason (Ed.). *Test anxiety: Theory, research, and application* (pp. 349-378). Hillsdale, NJ: Erlbaum.
- Wong, Y. J., & Rochlen, A. B. (2009). Potential benefits of expressive writing for male college students with varying degrees of restrictive emotionality. *Psychology of Men & Masculinity*, 10(2), 149-159. doi:10.1037/a0015041
- Yogo, M., & Fujihara, S. (2008, February). Working memory capacity can be improved by expressive writing: A randomized experiment in a Japanese sample. *British*

Journal of Health Psychology, 13(1), 77-80. Retrieved August 23, 2009,
doi:10.1348/135910707X252440

Zbiek, R.M., Heid, M.K., Blume, G.W., & Dick, T. (2007). Research on technology in Mathematics education: A perspective of constructs. In F. Lester (Ed.), *Second Handbook of research on mathematics teaching and learning* (pp.1169-1207). Charlotte, NC: Information Age.

Zeidner, M. (1998). *Test Anxiety: The state of the art*. New York, NY: Plenum Press.

Zeidner, M., & Mathews, G. (2005). *Handbook of competence and motivation*, ed.

Elliott, A. & Dweck, C.S., 141-163. London: Guilford Press.

Zeidner, M., & Safir, M. (1989, June). Sex, Ethnic, and Social Differences in Test Anxiety Among Israeli Adolescents. *Journal of Genetic Psychology*, 150(2), 175.
Retrieved August 16, 2009, from Academic Search Complete database.

APPENDICES

APPENDIX A: THE MULTIPLE AFFECT ADJECTIVE CHECKLIST- REVISED

MARKING INSTRUCTIONS																																																																																																																	
<ul style="list-style-type: none"> • USE A NO. 2 PENCIL ONLY. • FILL CIRCLES IN COMPLETELY. CORRECT MARK: ● • ERASE ALL CHANGES CLEANLY. • MAKE NO STRAY MARKS. 																																																																																																																	
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NAME _____

The MULTIPLE AFFECT ADJECTIVE CHECK LIST-R

MAACL-R

STATE ~ TODAY FORM

By Marvin Zuckerman and Bernard Lubin

DIRECTIONS:

On the back of this sheet you will find words which describe different kinds of moods and feelings. Blacken ● in the circles beside the words which describe how you *feel right now, today*. Some of the words may sound alike, but we want you to **check all** the words that **describe** your feelings. Work rapidly.



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PRINTED IN U.S.A.

MCR-023-S

	A	D	H	PA	SS	Dys	PASS	NO. CHECKED
Raw Score								
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Multiple Affect Adjective Check List - R (MAACL-R)

- | | | | |
|---------------------------------------|--|--------------------------------------|--|
| 1. <input type="radio"/> active | 34. <input type="radio"/> devoted | 67. <input type="radio"/> interested | 100. <input type="radio"/> satisfied |
| 2. <input type="radio"/> adventurous | 35. <input type="radio"/> disagreeable | 68. <input type="radio"/> irritated | 101. <input type="radio"/> secure |
| 3. <input type="radio"/> affectionate | 36. <input type="radio"/> discontented | 69. <input type="radio"/> jealous | 102. <input type="radio"/> shaky |
| 4. <input type="radio"/> afraid | 37. <input type="radio"/> discouraged | 70. <input type="radio"/> joyful | 103. <input type="radio"/> shy |
| 5. <input type="radio"/> agitated | 38. <input type="radio"/> disgusted | 71. <input type="radio"/> kindly | 104. <input type="radio"/> soothed |
| 6. <input type="radio"/> agreeable | 39. <input type="radio"/> displeased | 72. <input type="radio"/> lonely | 105. <input type="radio"/> steady |
| 7. <input type="radio"/> aggressive | 40. <input type="radio"/> energetic | 73. <input type="radio"/> lost | 106. <input type="radio"/> stubborn |
| 8. <input type="radio"/> alive | 41. <input type="radio"/> enraged | 74. <input type="radio"/> loving | 107. <input type="radio"/> stormy |
| 9. <input type="radio"/> alone | 42. <input type="radio"/> enthusiastic | 75. <input type="radio"/> low | 108. <input type="radio"/> strong |
| 10. <input type="radio"/> amiable | 43. <input type="radio"/> fearful | 76. <input type="radio"/> lucky | 109. <input type="radio"/> suffering |
| 11. <input type="radio"/> amused | 44. <input type="radio"/> fine | 77. <input type="radio"/> mad | 110. <input type="radio"/> sullen |
| 12. <input type="radio"/> angry | 45. <input type="radio"/> fit | 78. <input type="radio"/> mean | 111. <input type="radio"/> sunk |
| 13. <input type="radio"/> annoyed | 46. <input type="radio"/> forlorn | 79. <input type="radio"/> meek | 112. <input type="radio"/> sympathetic |
| 14. <input type="radio"/> awful | 47. <input type="radio"/> frank | 80. <input type="radio"/> merry | 113. <input type="radio"/> tame |
| 15. <input type="radio"/> bashful | 48. <input type="radio"/> free | 81. <input type="radio"/> mild | 114. <input type="radio"/> tender |
| 16. <input type="radio"/> bitter | 49. <input type="radio"/> friendly | 82. <input type="radio"/> miserable | 115. <input type="radio"/> tense |
| 17. <input type="radio"/> blue | 50. <input type="radio"/> frightened | 83. <input type="radio"/> nervous | 116. <input type="radio"/> terrible |
| 18. <input type="radio"/> bored | 51. <input type="radio"/> furious | 84. <input type="radio"/> obliging | 117. <input type="radio"/> terrified |
| 19. <input type="radio"/> calm | 52. <input type="radio"/> lively | 85. <input type="radio"/> offended | 118. <input type="radio"/> thoughtful |
| 20. <input type="radio"/> cautious | 53. <input type="radio"/> gentle | 86. <input type="radio"/> outraged | 119. <input type="radio"/> timid |
| 21. <input type="radio"/> cheerful | 54. <input type="radio"/> glad | 87. <input type="radio"/> panicky | 120. <input type="radio"/> tormented |
| 22. <input type="radio"/> clean | 55. <input type="radio"/> gloomy | 88. <input type="radio"/> patient | 121. <input type="radio"/> understanding |
| 23. <input type="radio"/> complaining | 56. <input type="radio"/> good | 89. <input type="radio"/> peaceful | 122. <input type="radio"/> unhappy |
| 24. <input type="radio"/> contented | 57. <input type="radio"/> good-natured | 90. <input type="radio"/> pleased | 123. <input type="radio"/> unsociable |
| 25. <input type="radio"/> contrary | 58. <input type="radio"/> grim | 91. <input type="radio"/> pleasant | 124. <input type="radio"/> upset |
| 26. <input type="radio"/> cool | 59. <input type="radio"/> happy | 92. <input type="radio"/> polite | 125. <input type="radio"/> vexed |
| 27. <input type="radio"/> cooperative | 60. <input type="radio"/> healthy | 93. <input type="radio"/> powerful | 126. <input type="radio"/> warm |
| 28. <input type="radio"/> critical | 61. <input type="radio"/> hopeless | 94. <input type="radio"/> quiet | 127. <input type="radio"/> whole |
| 29. <input type="radio"/> cross | 62. <input type="radio"/> hostile | 95. <input type="radio"/> reckless | 128. <input type="radio"/> wild |
| 30. <input type="radio"/> cruel | 63. <input type="radio"/> impatient | 96. <input type="radio"/> rejected | 129. <input type="radio"/> willful |
| 31. <input type="radio"/> daring | 64. <input type="radio"/> incensed | 97. <input type="radio"/> rough | 130. <input type="radio"/> wilted |
| 32. <input type="radio"/> desperate | 65. <input type="radio"/> indignant | 98. <input type="radio"/> sad | 131. <input type="radio"/> worrying |
| 33. <input type="radio"/> destroyed | 66. <input type="radio"/> inspired | 99. <input type="radio"/> safe | 132. <input type="radio"/> young |

APPENDIX B: PENNEBAKER INVENTORY OF LIMBIC LANGUIDNESS

The PILL (Modified): A Trait Measure

Common symptoms which most people have experienced them at one time or another are listed. We are currently interested in finding out how prevalent each symptom is among high school students. All data will be confidential. Next to the number corresponding to the symptoms shown below, darken the circle which indicates how frequently you experience that symptom. For all items, use the following scale:

	Have never or almost never experienced	Every week or so	More than once a week
Increased heart rate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faster breathing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dryness in mouth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Upset stomach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sudden need to use the restroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hands perspiring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Body perspiring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Face flushes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cold and clammy hands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sweaty palms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hands shaking or trembling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Body shaking or trembling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muscle tension	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Twitching or muscle spasms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lump in throat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling dizzy or faint	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eyes water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX C: MATH ANXIETY RATING SCALE (MARS)

Name _____

Total Score _____

MATHEMATICS ANXIETY RATING SCALE (MARS-A)

The items in the questionnaire refer to things and experiences that may cause tension or apprehension. For each item, place a check (✓) in the circle under the column that describes how much you would be made anxious by it. Work quickly, but be sure to think about each item.

	How anxious . . .	Not at all	A little	A fair amount	Much	Very much
1. Deciding how much change you should get back from buying several items.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Having someone watch you as you add up a column of numbers.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Having someone watch you as you divide a five digit number by a two digit number.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Being asked to add up $976 + 777$ in your head.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Adding up $976 + 777$ on paper.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Figuring out a simple percentage, like the sales tax on something you buy.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Figuring out how much you will get paid for $6\frac{1}{2}$ hours of work if you get paid \$3.75 an hour.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Listening to a person explain how your share of expenses on a trip was figured out (including meals, transportation, housing, etc.).		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Counting a pile of change.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Adding up a bill for a meal when you think you have been over-charged.		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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APPENDIX D: INITIAL RESEARCH LETTER TO PARENTS

Dear Parents:

We are conducting a study involving a study on the assessment of mathematics anxiety and stress. The participants will be asked to participate in brief writing activities and complete surveys that assess the students' feelings and attitudes. The study will involve students in a control or experimental group. Only the students in the experimental group will participate in the brief writing activity. Students in the control group will write on a neutral topic. To conduct this study we need the participation of children who will be enrolled in the second semester of geometry, ages 14 – 18 in various grade levels. There will be no costs for participation in the study and a pizza social will be provided as compensation for student participation. There are no direct benefits from this study and participation is voluntary. If any (unexpected) psychological distress is encountered as a result of participating in the study, the students may stop at any time, without penalty, and have the option to talk with their school counselor or the student assistance counselor.

The attached "Permission for Child's Participation" form describes the study and asks your permission for your child to participate. Please carefully read the attached "Permission for Child's Participation" form. It provides important information for you and your child. If you have any questions or concerns pertaining to the attached form or to the research study, please feel free to contact Dr. George Maihafer, IRB chairperson (757) 489-2389, and the Office of Research (757) 683-3460 or Dr. Nina Brown, academic advisor at (757) 683-3245

After reviewing the attached information, please return a signed copy of the "Permission for Child's Participation" form to the name and address on the self-addressed envelope if you are willing to allow your child to participate in the study. Keep the additional copy of the form for your records. Even when you give consent, your child will be able to participate only if he/she is willing to do so.

We thank you in advance for taking the time to consider your child's participation in this study.

Sincerely,

Claudia L. Hines, CAS

Dr. Nina Brown, Ed.D., LPC, NCC
Old Dominion University

APPENDIX E: PERMISSION FOR CHILD'S PARTICIPATION DOCUMENT

The purposes of this form are to provide information that may affect decisions regarding your child's participation and to record the consent of those who are willing for their child to participate in this study.

TITLE OF RESEARCH: The effects of expressive writing on cognitive processes, stress, general anxiety, and mathematics anxiety on the Virginia Standards of Learning (SOL) on a sample of urban high school students failing mathematics.

RESEARCHER(S): Claudia L. Hines, Assistant Principal of Instruction
Old Dominion University

DESCRIPTION OF RESEARCH STUDY: The purpose of this research will be to see if there will be a reduction in anxiety, stress and mathematics anxiety. Research will be explored on cognitive processes, analyzing writing samples, to see if there is an improvement in Virginia Standard of Learning (SOL) scores for students who are considered to be at risk because of previous academic achievement in mathematics. Upon completion of the tests, the experimental group will be asked to participate in an activity in which the student will write on three topics over a period of three days for 15 minutes. The Practice SOL test will be administered at the beginning of the research and again at the end to see if scores improved.

If you decide to allow your child to participate in this study, your child will take a series of three tests focusing on stress, anxiety and math anxiety. Your child's participation will take approximately thirty minutes for each test and 15 minutes for the expressive writing intervention over a period of three days.

EXCLUSIONARY CRITERIA: All students enrolled in your teacher's second semester geometry classes are eligible to participate.

RISKS:

No identifiable risks are associated with this research project. There is some possibility, as with any research, that you may be subject to risks that have not been identified. If, at

any time your participation causes you to experience any increase in psychological or physical discomfort, you may stop your participation. You may contact your teacher, school nurse, parent or guardian if you so desire.

BENEFITS: There are no direct benefits for participating in this research study. A summary of results will be made available to both teachers and parents.

COSTS AND PAYMENTS: Participation in this study is voluntary. If you are present during all of the data collection, students will be invited to a pizza social during lunch.

NEW INFORMATION: You will be contacted if new information is discovered that would reasonably change your decision about your child's participation in this study

CONFIDENTIALITY: Participants will be assigned a code number so that your child's name will not be attached to his or her responses. Only researchers involved in the study or in a professional review of the study will have access to data sheets. All data and participant information will be kept in a locked and secure location.

WITHDRAWAL PRIVILEGE: Your child's participation in this study is completely voluntary. It is all right to refuse your child's participation. Even if you agree now, you may withdraw your child from the study at any time. In addition, your child will be given a chance to withdraw at any time if he/she so chooses.

COMPENSATION FOR ILLNESS AND INJURY: Agreeing to your child's participation does not waive any of your legal rights. However, in the event of harm arising from this study, neither Old Dominion University nor the researchers are able to give you any money, insurance coverage, free medical care, or any other compensation. In the event that your child suffers harm as a result of participation in this research project, you may contact Dr. Nina Brown at (757) 683-3245 or nbrown@odu.edu. or Dr. George Maihafer, Chair of the Institutional Review Board at (757) 683-4520.

VOLUNTARY CONSENT: By signing this form, you are saying 1) that you have read this form or have had it read to you, and 2) that you are satisfied you understand this form, the research study, and its risks and benefits. The researchers will be happy to answer any questions you have about the research.

If at any time you feel pressured to allow your child to participate, or if you have any questions about your rights or this form, please call Dr. George Maihafer, Chair of the Institutional Review Board Chair (757-683-4520) or the Old Dominion University Office of Research (757-683-3460).

Note: By signing below, you are telling the researchers YES, that you will allow your child to participate in this study. Please keep one copy of this form for your records.

Your child's name (please print): _____

Your child's birth date: _____

Your name (please print): _____

Relationship to child (please check one):

Parent: _____

Guardian: _____

Your Signature: _____

Date: _____

INVESTIGATOR'S STATEMENT: I certify that this form includes all information concerning the study relevant to the protection of the rights of the participants, including the nature and purpose of this research, benefits, risks, costs, and any experimental procedures.

I have described the rights and protections afforded to human research participants and have done nothing to pressure, coerce, or falsely entice the parent to allowing this child to participate. I am available to answer the parent's questions and have encouraged him/her to ask additional questions at any time during the course of the study.

Experimenter's Signature: _____

Date: _____

APPENDIX F: FAMILY CONSENT TO PARTICIPATE IN STUDY

I, _____ have been given information regarding the upcoming research in a geometry class at High School and agree to have my son/daughter participate. I understand that the information obtained is confidential and will be used as part of the dissertation requirements at Old Dominion University. I understand that my son/daughter's name will not be used during this research and that the data collection will be obtained for the purpose of research only. I understand that I have the option to opt out of my child's participation without penalty.

() Yes, I would like my son/daughter to participate.

() No, I would not like my son/daughter to participate.

Signed: _____
(Student)

Date:

Signed: _____
(Parent or guardian)

Date:

APPENDIX G: STUDENT CONSENT TO PARTICIPATE

I, _____ have been given information regarding the upcoming research in a geometry class at High School and agree to participate. I understand that the information obtained is confidential and will be used as part of the dissertation requirements at Old Dominion University. I understand that my name will not be used during this research and that the data collection will be obtained for the purpose of research only. I understand that I have the option to opt out of participation without penalty.

- () Yes, I would like to participate.
() No, I would not like to participate.

Signed: _____ Date: _____
(Student)

APPENDIX H: STUDENT ASSENT LETTER

Dear Student:

We are conducting a study involving a study on the assessment of mathematics anxiety and stress. The participants will be asked to participate in brief writing activities and complete surveys that assess the students' feelings and attitudes. The study will involve students in a control or experimental group. Only the students in the experimental group will participate in the brief writing activity. Students in the control group will write on a neutral topic. To conduct this study we need the participation of children who will be enrolled in the second semester of geometry, ages 14 – 18 in various grade levels. There will be no costs for participation in the study and a pizza social will be provided as compensation for student participation. There are no direct benefits from this study and participation is voluntary. If any (unexpected) psychological distress is encountered as a result of participating in the study, the students may stop at any time, without penalty, and have the option to talk with their school counselor or the student assistance counselor.

The attached "Assent Permission Form" describes the study and asks your permission to participate. Please carefully read the attached "Assent Permission Form". It provides important information for you. If you have any questions or concerns pertaining to the attached form or to the research study, please feel free to contact Dr. George Maihafer, IRB chairperson (757) 489-2389, and the Office of Research (757) 683-3460 or Dr. Nina Brown, academic advisor at (757) 683-3245

After reviewing the attached information, please return a signed copy of the "Assent Permission Form" to the name and address on the self-addressed envelope if you are willing to participate in the study. Keep the additional copy of the form for your records. Even when you give consent, you will be able to participate only if you are willing to do so.

We thank you in advance for taking the time to consider participation in this study.

Sincerely,

Claudia L. Hines, CAS

Dr. Nina Brown, Ed.D., LPC, NCC
Old Dominion University
757-683-3245

APPENDIX I: ASSENT PERMISSION PARTICIPATION DOCUMENT

The purposes of this form are to provide information that may affect decisions regarding your participation and to record the consent of those who are willing to participate in this study.

TITLE OF RESEARCH: The effects of expressive writing on cognitive processes, stress, general anxiety, and mathematics anxiety on the Virginia Standards of Learning (SOL) on a sample of urban high school students failing mathematics.

RESEARCHER(S): Claudia L. Hines, Assistant Principal of Instruction
Old Dominion University

DESCRIPTION OF RESEARCH STUDY: The purpose of this research will be to see if there will be a reduction in anxiety, stress and mathematics anxiety. Research will be explored on cognitive processes, analyzing writing samples, to see if there is an improvement in Virginia Standard of Learning (SOL) scores for students who are considered to be at risk because of previous academic achievement in mathematics. Upon completion of the tests, the experimental group will be asked to participate in an activity in which the student will write on three topics over a period of three days for 15 minutes. The Practice SOL test will be administered at the beginning of the research and again at the end to see if scores improved.

If you decide to participate in this study, you will take a series of three tests focusing on stress, anxiety and math anxiety. Participation will take approximately thirty minutes for each test and 15 minutes for the expressive writing intervention over a period of three days. Students in the control group will write on a neutral topic.

EXCLUSIONARY CRITERIA: All students enrolled in your teacher's second semester geometry classes are eligible to participate.

RISKS:

No identifiable risks are associated with this research project. There is some possibility, as with any research, that you may be subject to risks that have not been identified. If, at *any* time your participation causes you to experience any increase in psychological or

physical discomfort, you may stop your participation. You may contact your teacher, school nurse, parent or guardian if you so desire.

BENEFITS: There are no direct benefits for participating in this research study. A summary of results will be shared with participants.

COSTS AND PAYMENTS: Participation in this study is voluntary. If you are present during all of the data collection, you will be invited to a pizza social during lunch.

NEW INFORMATION: You will be contacted if new information is discovered that would reasonably change your decision about participation in this study

CONFIDENTIALITY: Participants will be assigned a code number so that your name will not be attached to his or her responses. Only researchers involved in the study or in a professional review of the study will have access to data sheets. All data and participant information will be kept in a locked and secure location.

WITHDRAWAL PRIVILEGE: Your participation in this study is completely voluntary. It is all right to refuse participation. Even if you agree now, you may withdraw from the study at any time.

COMPENSATION FOR ILLNESS AND INJURY: Agreeing to participation does not waive any of your legal rights. However, in the event of harm arising from this study, neither Old Dominion University nor the researchers are able to give you any money, insurance coverage, free medical care, or any other compensation. In the event that you suffer harm as a result of participation in this research project, you may contact Dr. Nina Brown at (757) 683-3245 or nbrown@odu.edu, or Dr. George Maihafer, Chair of the Institutional Review Board at (757) 683-4520.

VOLUNTARY CONSENT: By signing this form, you are saying 1) that you have read this form or have had it read to you, and 2) that you are satisfied you understand this form, the research study, and its risks and benefits. The researchers will be happy to answer any questions you have about the research.

If at any time you feel pressured to participate, or if you have any questions about your rights or this form, please call Dr. George Maihafer, Chair of the Institutional Review Board Chair (757-683-4520) or the Old Dominion University Office of Research (757-683-3460) or Dr. Nina Brown at (757) 683-3245.

Note: By signing below, you are telling the researcher(s) YES, that you will participate in this study. Please keep one copy of this form for your records.

Your name (please print): _____

Your Signature:

Date:

INVESTIGATOR'S STATEMENT: I certify that this form includes all information concerning the study relevant to the protection of the rights of the participants, including the nature and purpose of this research, benefits, risks, costs, and any experimental procedures.

I have described the rights and protections afforded to human research participants and have done nothing to pressure, coerce, or falsely entice the parent to allowing this child to participate. I am available to answer the parent's questions and have encouraged him/her to ask additional questions at any time during the course of the study.

Experimenter's Signature:

Date:

APPENDIX J: STUDENT ASSENT CONSENT FORM

I, _____ have been given information regarding the upcoming research in a geometry class at Warwick High School and agree to participate. I understand that the information obtained is confidential and will be used as part of the dissertation requirements at Old Dominion University. I understand that my name will not be used during this research and that the data collection will be obtained for the purpose of research only. I understand that I have the option to opt out of participation without penalty.

() Yes, I would like to participate.

() No, I would not like to participate.

Signed: _____ Date: _____
(Student)

APPENDIX K: FOLLOW UP LETTER TO PARENTS AFTER RESEARCH

Dear Parents:

Thank you again for allowing your son/daughter to participate in the recent study on the effects that math anxiety, stress, cognitive and psychological processing had on the practice SOL scores. In the previous permission letter, it was noted that the students would be a part of either the experimental or control group with both participating in three assessment tools and a brief writing activity. The purpose of the research was to see if a reduction in anxiety would increase results on the practice SOL test. During the study, the student's data and confidential records were securely stored in a locked file cabinet. Writing samples and instrument answers were not shared with the participant's teacher.

There were three instruments used along with the expressive writing intervention. These instruments included: The Pennebaker Inventory of Limbic Languidness (PILL) which measured the frequency general physical symptoms and sensations associated with stress; the Math Anxiety Rating Scale (MARS) which measured math anxiety and the Multiple Affect Adjective Checklist-Revised (MAACL-R) which was used to quantify the subject's level of anxiety. The writing samples on cognitive and psychological processing were analyzed using the LIWC-2001 software program.

Results from this study resulted in a decrease in anxiety and an increase in the final SOL mathematics' scores with an overall pass rate of 51%. Both the experimental group and the control group had a reduction in math anxiety after the expressive writing intervention. The expressive writing appeared to be therapeutic for both groups whether they wrote on a value-laden topic or a neutral topic.

In summary, the students participating in the experimental group did show an increase in their overall results on the SOL geometry test. Please know that your permission and your student's willingness to participate was most appreciated in this research process. The results of this study may continue to be used to further break down the academic barriers that our students may encounter as they work towards mastery of mathematics education.

VITA

Claudia Lorene Hines

EDUCATION

2008-2011	Counseling Old Dominion University: Norfolk, VA Doctor of Philosophy June, 2011
2002-2003	Educational Leadership and Administration Certification Old Dominion University: Norfolk, VA
1998 - 1999	Certificate of Advanced Studies (C.A.S.) in Counseling Old Dominion University: Norfolk, VA
1995	Master of Arts Degree in Agency Counseling Hampton University: Hampton, VA (December, 1995)
1993	Bachelor of Arts Degree in General Studies Hampton University: Hampton, VA (December, 1993)
1991	Associate of Arts Degree in Human Services Thomas Nelson Community College Hampton, VA (May, 1991)

PROFESSIONAL EXPERIENCE

Assistant Principal Middle and High School

Adjunct Professor: University and Community College

High School Magnet Director

High School Counselor

Residential Treatment Center Counselor

PRESENTATIONS

APA Annual Convention - Washington, D.C.

Assistant Principals' Workshop

VACES Graduate Student Conference

Counseling Graduate Student Conference

NSF Marine Tech Project: Student Activities

Virginia High School League: Student Leadership Conference

PUBLICATIONS

Fall 2009

Journal of Effective Schools: Peer Sexual Harassment in Schools: National Peer Refereed Journal- Nina W. Brown, Ed.D, Old Dominion University; Claudia Hines, CAS.; Caron Coles, M.S. Ed.

Professional Credentials:

Memberships	American Counseling Association (ACA) American Psychological Association (APA)
License Type	Postgraduate Professional License
Endorsement(s)	Administration and Supervision PreK-12 Secondary School Counselor

Research:

Dissertation: Use of Expressive Writing on Cognitions, Stress and Anxiety of a Sample of Urban High School Students Failing Mathematics